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[OFFICIAL NOTICE.]

Where to Find the Western Gas Association's Exhibit, and the Custodian Thereof, at the World's Fair.

To the Fraternity: The exhibit of the Western Gas Association, at the World's Fair, St. Louis, is located in Section 33A, Liberal Arts Building, where Mr. Fred. R Persons, who is in charge of the same, will always be on hand to receive visitors and to explain anything that requires explaining.

[NOTICE.]

Twelfth Annual Meeting, Michigan Gas Association.

JACKSON GAS COMPANY,
JACKSON, MICH., July 20, 1904.

To the Members of the Michigan Gas Association: Preparations for the meeting of the Michigan Gas Association, to be held in Jackson, September 21st and 22d, 1904, are now well underway. The following papers are promised definitely:

"Retort House Practice in a Small Works," by Mr. George C. Turner, Secretary Coldwater (Mich.) Gas Light and Fuel Company.

"Temperatures as Applied to the Production and Purification of Coal Gas," by Mr. V. F. Dewey, Asst. Supt., Detroit City Gas Company.

"Commercial Lighting," by Mr. R. Schacklette, Manager Adrian (Mich.) Gas Company.

Also, a most interesting report on "Naphthaline," by Messrs. White and Ball.

In this connection let me call your attention to the "Question Box," with its special feature known as the "Trouble Box," which is in charge of Mr. E. F. Lloyd. Every member can help make this special feature a success by sending to Mr. Lloyd good, live questions or by relating their experience, or by asking help on the troubles they have had during the past year. If you have no questions to ask, no new experiences during the past year, and have encountered no troubles, this "Question Box" cannot help you. If the contrary is true, write to Mr. Lloyd, and *do it now*. Remember, all these things will be referred to some member for investigation, all of which takes time, and you should be as prompt as possible in communicating with Mr. Lloyd.

Don't forget to bring an application for membership from some fellow not now in the fold, and *be sure to attend the meeting yourself*.

Wishing that I will have the pleasure of welcoming you in Jackson,

Yours very truly, S. E. WOLFF, President.

[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

OFFICE OF EDITOR WRINKLE DEPARTMENT,
ST. LOUIS, MO., July 25, 1904.

To the Members of the Western Gas Association: We again invite contributions to the Wrinkle Department of the Western Gas Association for the meeting of 1905. The Editor wishes to call the attention of the members of the Western Gas Association, and of the gas fraternity at large, to the fact that the "Western" has done good work in this department in the past; that its Wrinkles have been of value to many, and that it proposes to continue the good work.

The Editor further wishes to suggest that an earnest effort be made to improve the quality of the Wrinkles submitted, as a great many of the devices, while of undoubted practical value, are such as any gas works' foreman should know. We desire the Wrinkles which have a greater bearing on the scientific and technical portion of our business. Of course, there will always be room for the little, handy, practical devices, which so often help us over the rough places. We will gladly receive them, but we should all aim to place the gas business on a par with other scientific and engineering enterprises which are practically in a basis of exact knowledge and high efficiency.

LIBRARY OF CONGRESS
AUG 1 1904
SMITHSONIAN DEPOSIT

To that end, therefore, we desire to secure a large collection of Wrinkles for the 1905 meeting. Give us the benefit of the mathematical, chemical, thermal and other devices which have helped you in designing or improving your plants; do not hesitate to send in the practical devices which are not on record so far; submit the ideas which have made the business end a success; and, finally, let every individual contribute his portion, so that the result may be worthy the achievements of the past, and a credit to the Western Gas Association.

The following wrinkle is submitted as a sample to guide others somewhat in working out their contributions to this department. This describes a method of regulating the pressure on the outlet of a holder in proportion to the rate of sendout, and was contributed by the writer to another Association some time ago.

"The essential idea of street pressure regulation is to maintain a certain pressure at the consumers' meters within a small percentage either way of the fixed pressure. As the consumption increases or decreases, the holder pressure should be raised or lowered. This is usually done by having recording pressure gauges located in the district supplied by the holder, and raising or lowering the holder pressure until the best average for the district is reached.

"Now, it is, of course, true that the same conditions of consumption never obtain on successive days or months, and, therefore, the following automatic indicator was suggested by the writer: In the outlet pipe of the holder we place a Pitot tube facing the holder. Naturally, the opening from the Pitot tube which faces the stream of flowing gas gives the pressure due to the sum of the static head plus the impact or velocity head, whereas the side openings give the pressure due to the static head only. Therefore, any variation in the rate of flow of the gas is at once indicated by the variation in differential pressure from the two openings of the Pitot tube.

"By using a very sensitive differential pressure gauge, we can thus observe this variable rate of flow. It is, of course, necessary to calibrate the instrument for each holder to be able to tell what pressures to carry on the outlet pipe for each division on the sensitive differential gauge, and it would probably be well to check this three or four times during the year. The Laclede Gas Light Company has so far secured three satisfactory types of extremely sensitive differential pressure gauges, and we have arranged them with two scales, one of which shows the divisions in millimeters and the other gives the proper pressures to be carried on the holder outlet opposite the indicator on the gauge. The writer purposely refrains from adding drawings or too much detail to the above description, as he merely wishes to submit one idea, which he hopes will suggest many others to help swell the contribu tions."

We must start the work at once; therefore, please send your ideas to he Edito r, 716 Locust street, St. Louts, Mo., and oblige, Yours truly,

W. A. Baehr, Editor Wrinkle Department.

BRIEFLY TOLD.

Notes.—

At the annual meeting of the shareholders in the Gettysburg (Pa.) Gas Company the officers elected were: Directors, Charles S. Duncan, W. W. Hafer, S. A. Hammond, M. E. Zinn, D. M. Wolf, D. P. McPherson and Russell Stevenson; President, Charles S. Duncan; Secretary and Treasurer, Donald P. McPherson; Superintendent, A. B. Plank. The annual report of the President showed a tremendous gain in output, aud it also details the construction and cost of the storage holder, which was completed some time ago.

The franchise to construct and operate a gas plant in North Yakima, Wash., has been awarded to William W. Dunn, of Seattle, and A. F. Campbell, of Yakima. Under the agreement construction work must be commenced within 90 days, and the plant must be in actual operation prior to September 1, 1905.

The payment by the United Gas Improvement Company to the authorities of Philadelphia, under the terms of the lease by which the former supplies gas in the named city, for the quarter ended June 30th amounted to $163,384.56. The rate is 10 cents per 1,000 cubic feet sold.

The Rochester (N. H.) Gas Light Company is to be revived and rehabilitated. The parties in interest are residents of Haverhill, Mass., and the prime movers are Chas. Morse and J. J. Cashman.

At the annual meetiug of the Greenfield (Mass.) Gas Company the officers elected were: Directors, J. D. Safford, W. N. Washburn, Dana Malone, V. A. Forbes and W. S. Allen; President, J. D. Safford; Treasurer and Superintendent, A. R. Willard; Clerk and Auditor, W. S. Allen.

[Report, as Furnished by the Secretary—Continued from Page 129.]

PROCEEDINGS OF THE CONGRESS OF GAS ASSOCIATIONS OF AMERICA.

Held in Library Hall, Hall of Congress, Louisiana Purchase Exhibition, St. Louis, Mo., Wednesday and Thursday, June 15 and 16.

Wednesday's Session, June 15.

The President (Mr. Stone) introduced Mr. Ira C. Copley, of Aurora, Ills., who read the following paper on

CITY GAS INSPECTION AND INSPECTORS.

Mr. President and Gentlemen: When asked to prepare a paper on "City Gas Inspection and Inspectors," I had an idea that most of the subject matter of paper could be developed from studying the various municipal regulations governing this point. To my surprise I find that only a few of the larger cities have any regulations whatever, and only two or three enforce them rigidly. This statement, of course, does not apply to the municipalities in Massachusetts.

Finding little of value among the regulations of the different municipalities, I went to the statutes of the different States, and find that legislation has been enacted in Massachusetts, New York, Connecticut, New Jersey, Delaware, Ohio and California. An examination of the indices of the statutes of the other States fails to show anything on the subject.

The various municipalities and the State statutes that have come under my observation have naturally divided this question of inspection into two parts: The determination of the efficiency and purity of the gas and the testing of the gas meter to assure the consumer that he is getting all that he pays for; therefore, if I carry out the President's request, it will be necessary to make suggestions along these two lines.

The problem of devising a scheme of gas inspection that will be satisfactory in cities of all sizes and for all localities, without working undue hardship to anyone is indeed complex. The prescribing of the duties of the gas inspector is comparatively simple. The first principle, without which no solution is possible, is a sincere desire on the part of the management of any gas undertaking to serve the public with the best product possible and at a fair profit. The second is absolute honesty of dealing on the part of the municipal officials, including the gas inspector.

It is first necessary to start with the hypothesis that there should be no need of city or other inspections and inspectors, but even then it is a matter of the greatest importance that the purchaser shall be satisfied he is getting what he pays for; and I take it for granted that each one of you realizes that a reputation for fairness on the part of the company is an asset of great value.

It is a simple matter for the greater municipalities of this country to adopt regulations that will insure to the consumer quality of gas and accuracy of measurements, without working any hardship which the writer would consider at all commensurate with the benefits to be derived by the company itself. At most, an inspection bureau of two or three men could entirely cover any one city, and the consumers of the company who were dissatisfied could be answered by the company that there was the statement of their own employee, the official municipal inspector. The cost of maintaining this department, even if borne entirely by the gas company, would be so insignificant that it could scarcely be represented by fractions of 1 cent per 1,000 cubic feet of gas sold; but with the medium and smaller sized cities, the problem is very different—either a serious burden must be added to the cost of producing the gas, or it must be shifted to the shoulders of those who purchase it, if competent inspection is to be provided.

In my own line of reasoning I have adopted the State as a unit, believing such to be the only arrangement by which consumers and companies can be most nearly assured of inspection by inspectors not prejudiced by local conditions, for if one gas company in a single town of an entire State fails to recognize the obligation which it owes to the people which it serves, it is worth the while of all the people in that State to protect the citizens who are thus misused. It must be left for each municipal corporation to take care of its own, or for the State to take up the matter and provide assurances of satisfactory service and measurement for those of its citizens who buy gas for any purpose whatsoever.

If each municipality continues to work along independent lines, as is now the case in every State excepting Massachusetts, it means almost as many standards and almost as many methods as there are municipalities taking up the question, and in addition it means a confusion of local interests, which, in the judgment of the writer, might at some

time or other work hardship either to the consumer or the company. Many of the States recognizing this principle in other lines have adopted laws governing the purity and wholesomeness of foodstuffs sold within their limits and provide bureaus of inspection to insure the carrying out of their intentions.

The mere fact that the gas industry requires a permanent investment of enormous amounts of capital ought to make less need for regulation and inspection in this than in most other commodities sold. The nature of this investment is such that it might be prejudiced almost in its entirety; therefore, the capital needs a much more careful and conservative management.

There are no records which have come under the observation of the writer of any value whatever, excepting the annual reports of the Board of Gas and Electric Light Commissioners of the Commonwealth of Massachusetts. The statutes governing this Board and, in fact, all other State statutes on the subject, were enacted at a time when the illuminating value of the gas was of prime importance. The purposes for which gas are largely used now are very different from what they were at the time of these various enactments, and yet even a strict construction and enforcement of any of these statutes will work no hardship to either the consumer or the company.

The laws of Massachusetts are a long way in advance of any of the others, even in their conception and in the manner in which they are carried out. Those of New York, Connecticut, New Jersey, Delaware and Ohio are general in their scope. Those of California authorize cities of more than 100,000 population to fix a standard of quality and illuminating power, each for itself, providing that such illuminating power shall not be less than 16 candles.

From every standpoint from which we consider these various acts, we are brought back to the comparative completeness of those of Massachusetts. Of course, this State offers a particularly favorable field for the development of State inspection, for the reason that its area is comparatively small and its population comparatively dense, and yet the same principle of inspection might be adopted by all, excepting a few of the smaller States, without adding materially to the cost of gas either to the company or to the consumer.

It might be objected to the suggestion that each State adopt its own inspection bureau, that this plan would add to the cost of inspection in the larger cities and reduce the cost of inspection in the smaller ones, that such an arrangement would be undemocratic. I can offer in reply that it is the duty of every political unit, whether great or small, to take equal care of all of its citizens, and the citizens who are more favored in one line are compelled to do a little something for their less favored fellows. The United States Government has recognized this principle in its postal laws. It will carry a letter many thousand miles for 2 cents, absolutely at a loss, whereas it will charge the same price for delivering a letter but a few blocks in any of the large cities of this country. Political units must have uniformity.

The Massachusetts law orders that every gas company which sells 15,000,000 cubic feet of gas or more per year for illuminating purposes, shall provide a suitable room at least a quarter of a mile from the works, such room containing a disk photometer of construction approved by the State Inspector, which shall be open to the inspector and his assistants on every week day, from 8 A.M. to 6 P.M. The modern development of the gas business might suggest an improvement by cutting out the words " for illuminating purposes," but it would be comparatively inexpensive to fit up such a room, and in addition to this, to add such other simple apparatus as is necessary to determine the quantity of sulphur, ammonia, carbonic acid, sulphuretted hydrogen and other undesirable ingredients.

The number of inspections which might be made yearly would be a matter for each bureau to take up for itself. The 18th annual report of the Massachusetts Commissioners states that the chief inspector alone made, during the year covered by this report, 231 inspections. The law further provides that each company shall have at least 2 inspections per year and once additional to every 6,000,000 cubic feet of gas sold by each company, but not oftener than once a week.

Many of our States have organized State banks under laws similar to the national banking act, but with broader powers, and many of the States have bank examiners just as the national banking system has examiners. These employees are paid a fee for examining the affairs of banks, and the fee is usually graduated according to the capital of the bank. I believe that it would be entirely possible for the gas inspection bureau to provide for a certain number of inspections per year according to the amount of gas sold by the companies, with a fee graduated, either according to the capital stock of the company, to the assessed valuation of the company, or better still, to the volume of sales of the company. The State might provide the inspector with a portable photometer for use in such towns in which it would be a real hardship to the company to maintain one. He might also be provided with a calorimeter and add the determination of heat units to the reading of the photometer.

The other line of work which the department would have to take up is that of testing meters, and I am sure you will all agree with me that you are willing to pay any reasonable sum to throw the responsibility of this on the shoulders of some recognized official authority.

Again, I can offer no better suggestion than to follow the Massachusetts law, with some modifications. If every consumer were assured that the meter set in his premises had been tested by some official inspector—his own employee as it were—it would very materially reduce the suspicion in which the veracity of that instrument is held. In Massachusetts the fee for this inspection is but 25 cents. This insignificant sum is properly a charge against the capital account of the company. By adding a few cents to this inspection fee, the department could be made well nigh self-supporting, and the capital account of the company would not be increased to such a degree that the earnings to which it is legitimately entitled could make an appreciable difference to each individual consumer.

It would be a simple matter for a company in any State placing an order for new meters, to have them sent, first, to the home office of the department for inspection, and, after being certified, to have them recrated and forwarded to the purchaser. The additional freight charge would be very small, and that, too, might properly be considered a capital charge against the company.

Have any of you ever kept a record of the number of meters that are tested for complaints? If so, you will not be surprised when I call your attention to the fact that this same 18th annual report of the Massachusetts Board shows but 996 meters tested for complaints during the year, and this out of a total of 243,938 meters. This percentage, insignificant as it appears, is the largest within the past 5 years. The contemplation of this, together with my own records on the subject, show that the percentage is so small that the tempest, annoying as it may seem, is of teapot proportions, and I believe if each one of you will go over his records he will find the Massachusetts report is a fair average of the percentage of its kind. My only comment on the inspector is that he should perform his duty, and my suggestion to you is that you make his work as light as possible.

All of this presupposes an arrangement, either by the large municipalities or by the State. There is scarcely a gas company represented in this Association which is not within such distance of some city of size sufficient to support an inspector, to make freight or express charges to and from that center of little account. All this presupposes that an inspection bureau has been created, either in large cities or under State control.

Most of the large cities already have a more or less active meter inspection bureau. Pending the adoption of some ideal form, I can only urge each one of you to use such means as are at your disposal. The man who has waited until he could get the best tools before making anything has generally spent his life in waiting. Those of you in the large cities can use your inspectors freely. Those of you in small places, tributary to the large places, can also use these inspectors, if not in every particular yet to great advantage.

The writer knows of several undertakings in cities too small to support a competent inspection bureau, that have for 10 years or more used the following plan with relation to meter inspection. When a customer makes a complaint he is asked to fix a time when he was satisfied with his meter. It may have been 2 or 3 months or it may have been several months past. After this time has been agreed upon, the company makes this offer: " We have all the apparatus necessary for accurately testing meters. We will remove your meter in your presence, take you to our room, show you the apparatus, explain its use and test the meter under your eyes." If the consumer is not satisfied with such an arrangement another plan is suggested—that the meter be removed in his presence and expressed to a representative of any maker of meters within the nearest large city supporting such a manufacturer's agent, a rival manufacturer if he prefers, the report to be made in duplicate, one to be sent to the consumer and one to the company.

If he still feels that he is in the hands of his enemies the offer is made to send it to the nearest large city having an official meter inspector. If the test is made by the company there is no charge whatever may be the result. If the meter shows more than 2 per cent. fast the company agrees to rebate that amount from the time at which the consumer has expressed himself as being satisfied with his meter and the company pays all the cost of the test. If the meter is more than 3 per cent. slow

it is made clear to the consumer that he ought to be as fair to the company and must expect to rebate the amount that he has gained through the error of the meter and to pay the cost of the test himself. If the meter is within these limits it is to be considered substantially correct, and, although the test was made for the satisfaction of the consumer, the company will divide the cost of the test with him.

The writer knows, of his own knowledge, that the percentage of tests for complaints has not exceeded that as reported by the Board of Commissioners of Massachusetts; so insignificant that it is not worthy of consideration as anything other than an incidental item of expense.

In summing up, I would say: First, that an official gas and meter inspection ought to be made a very valuable adjunct to any gas undertaking wherever the volume of business is of such proportions that the expense would not be too great. This might easily be avoided in the case of 95 per cent. of the gas sold in this country by the adoption of a system of State gas inspection. The other 5 per cent. would not be compelled to face a more serious problem at any time than they do at present.

Second, it ought to be encouraged by the various companies, for the reason that the public are just as prone to have confidence in their own employees, the official inspectors, as is the company; and next third, and most important, that the management of each company so earnestly strives to make inspection unnecessary and so sincerely welcomes any scheme that will honestly shift the burden of suspicion, which must arise in the minds of some to whom it sells gas, that more goodwill and more public confidence are assured. The writer believes that honestly administered, a State inspection bureau could be maintained in States in which 1 thousand million cubic feet of gas per year is sold, at an expenditure of less than one-half cent. per 1,000, and very much less as the volume of sales is increased.

Discussion.

The President (Mr. Shelton)—In taking up the discussion on this paper I want to bring out the reason that prompted me to ask Mr. Copley to write a paper on such a practical subject. In one of the companies with which I am connected a plan was suggested in the City Council for the testing of the gas, which was the result of a complaint made on the part of a man not a consumer of gas, but which arose through some personal rancor on his part, and he tried to saddle upon the local company an outrageous scheme of gas inspection. It was with a good deal of difficulty that the gas company was able to get a fair adjustment of the matter, and this instance brought home to my mind that lightning of the same kind is liable to strike any gas company. While the evil of bad city supervision is perhaps not a very extensive one, yet, where it does crop up, it is apt to be extremely burdensome to the gas company. It seemed to me that all gas companies would be in an immeasurably better position if we were able to show, when similar movements should be started for local gas inspection, what a proper gas inspection is—what a fairly defined and an impartial inspection is. In other words, that the subject should be reduced to a system, and that possibly a report of a special committee should be made defining practical gas tests, the place, the character and the frequency of the tests, etc. In other words, that a fair supervision of gas inspection would be so and so and that any gas company in any town threatened with city inspection would be able to fall back upon this report as a *standard of inspection*. Suppose the Western Gas Association, for which the paper was originally projected, or this Congress or the different gas associations, would come to an agreement concerning a standard of gas inspection, the gas company in any city could fall back on that standard and point out that it was perfectly willing to be inspected on fair lines, and that fair lines are those which have been investigated, reported upon and adopted by a majority of the gas interests. We have nothing to fear as a rule from fair inspection; in fact we welcome it. It really certifies to the good quality of gas we are putting out in a great majority of cases. What we do fear is unfair inspection, and we should draw out the difference between what is fair and unfair inspection, and we can only make this difference apparent by establishing what is fair and what is unfair. My hope is that this paper of Mr. Copley's will result in some action by which we could establish what is fair gas inspection. This subject brings to my mind again the advantages of joint action for the common benefit of all the gas interests. To me it is an excellent instance of where united action by the different associations of this country could establish fair standards, eliminating this trouble and that trouble successfully as we successively take up the different points and pass upon them. I hope the discussion of this subject will tend toward a practical plan of making uniform gas inspections, if possible. The subject is open for discussion.

Mr. Paul Thompson, Phila., Pa.—I will say, in connection with what Mr. Shelton has said and in view of Mr. Copley's paper, that my investigation of the subject in a meager way has brought me to about the same conclusion—that very few cities or municipalities are to day operating under any system of inspection, and those that are, lack in definiteness, in providing for a satisfactory meeting ground as between the gas company and the consumer. I ask Mr. Copley if he will explain a little more in detail the Massachusetts regulations which he, I think, stated were in his judgment the most intelligible and equitable of any in existence. He states that the candle power determination is to be made by apparatus approved by the State Inspector, but he did not state what the penalty was, or how the inspection was made, or how long a time they had in which to correct their candle power if it fell below the required standard, and whether the inspection was weekly or daily, or whether the penalty was imposed after a certain length of time. I think it most important that all these regulations should be defined. It was stated freely in connection with the report that received a great deal of consideration at the hands of the New York city papers that the Greater New York requirements were a certain candle power for 3 weeks, taking one test a week, and that they must not fall short for 3 successive weeks. The statement was made often in the papers that it was possible for the gas company to run below the requirements for two weeks and on the third week to bring the gas up to the required candle power. The allegation of the papers was that the gas company did not take care of the consumer properly, and it gave an opportunity for the public to assume that the gas company would reduce its candle power during the two weeks and make it all right the third week and still live up to the letter of the contract. I think any regulation which a gas company should agree to should be careful to definitely state the various points to which I have alluded.

The President (Mr. Shelton)—Will Mr. H. L. Doherty, who must have some views on this question, give us the benefit of them?

Mr. Doherty, New York City—I was not asked to discuss this subject until a day or two ago. I have no decided views on this subject, except that I am against any municipal or State control that can be avoided. I want to transact the business of the companies I am connected with in a way limited only by honor, and I want, if possible, to get the confidence of our customers so that they do not doubt the integrity of the company. I think there are some companies in this country where that result is secured.

Mr. Alten S. Miller, Baltimore, Md.--Our business, as has been stated a number of times, is the selling of energy. The method of measuring that energy, whether in the form of light or capacity for producing heat, is by measuring the product through a meter and then testing the quality of the product afterward. The question is, therefore, one between the gas consumers and the gas company. Unfortunately the gas consumer is not in a position to decide for himself whether he is getting the quality of gas contracted for or whether he is getting the proper quantity, and I think, therefore, that some provision should be made for him. The laws of the States are made, as a rule, by men who do not burn gas. The majority of the lawmakers are from the rural districts, and I do not think it ought to be left in the hands of the State, but rather in the hands of the municipal bodies, whose constituents are almost entirely gas consumers. Further, as against putting it in the hands of the State, I would say that it is very difficult to make a general law for the State that would be equitable to all and allow certain districts to get the advantage of local conditions. It seemed to be the consensus of opinion at the meeting of the Western Gas Association, which was held yesterday, that the question of candle power was a local condition. Suppose, for instance, some company can afford to sell natural gas to its consumers, using gas in Welsbach burners. It might be able to sell it for 25 cents, 30 cents or 40 cents, but if the State compels it to enrich the gas to 16 or 18 candles it will cost the consumers a great deal more for light—therefore, the consumers will be at a disadvantage on account of a general State inspection. I do think, however, there ought to be an inspection in every city, both as to quality and quantity, not for the benefit of the company directly, but indirectly, in that it can thus be relieved of responsibility and refer the matter to the consumers; and if there were not such a system of inspection in the city where I am located, I should be willing to pay for such a bureau. However, as regards the amount (Mr. Copley suggests 25 cents a meter), I would say that a company cannot afford to pay that amount for every inspection. Mr. Copley did not refer to re inspection of meters. The system is of no use unless the meters are re-inspected as repaired. Our custom is to remove meters for re inspection once every 3 years, whether they have been removed in the course of business or not. Added to that the number ordinarily removed in the course of business, we find that all meters are handled on an average once in

every 2 years. Twenty-five cents a meter would be a serious drain on the company. I would further say that the transportation of the meters to the office of the inspector is a very serious thing, and I have just made arrangements with our city fathers to inspect the meters in our shop, and I have agreed to pay an amount which we estimate is 10 cents a meter, which will fully cover all expenses of the testing and the handling of the meters by the city. The original ordinance was somewhat ambiguous. It allowed the city 25 cents for testing the meters. For a number of years the gas company paid 25 cents each for the testing and re-testing of the meters, but on studying the ordinance it seemed to me that it did not provide that the company should pay 25 cents for the re-testing, and, therefore, I stopped paying it. A case was carried through the courts on an agreed statement of facts and the company won. Then we said we did not want them to stop re testing and said we would pay the expenses of re-testing if they would do it in our shops, and that we would further allow the city inspector full access to our records to see where the meters were set and how long they were in each place, so as to put him in a position to be so familiar with the accounts of the company that when a consumer made a complaint we could shift him over to the city inspector and the city inspector will be in a position to say that he knew the meter was inspected on a certain date under such conditions, that the meter was set for use and had not been touched since, thus relieving the company of a great deal of trouble. The testing of the quality of gas is a very serious matter. There have been a great many discussions between men who have spent their lives in the gas industry on the question of the testing of the illuminating quality of gas. When that matter is delegated to a city official whose main idea is to draw his salary, it becomes a very serious and important question, and before any company voluntarily agrees to allow its gas to be tested for candle power it should see if it cannot in some way have a hand in the appointment of the inspector; that is to say, the company should see if it cannot influence the appointment of some man who is qualified to do the inspection work properly, because the qualification for the work is a very important thing. This leads back to the road which we are all traveling, that possibly it is much easier to test by calorimeter than by photometer, and the tests are undoubtedly more accurate. Possibly it may be well to influence the testing of gas by the calorimeter instead of the photometer.

Mr. H. D. Whitcomb, Jr., Newark, N. J.—I agree with what Mr. Miller has said in regard to the city inspector bringing to a short stop what would many times be a long argument. In one of the companies with which I am connected we have a city inspector and when an argument in regard to whether a meter is correct or not is brought forward by a consumer we offer to test the meter in his presence at our shop free of charge, or else have the city inspector test the meter for him, for which he will have to pay a dollar if the meter is correct within certain limits, and if it is not correct the company pays the charge. In the city of Newark, where we have this inspector, I think within the last year only 5 meters out of about 60,000 have gone to the city inspector for testing on complaint, so that the system of inspection has stopped the complaints in that respect to a very considerable extent.

Mr. T. D. Miller, New Orleans, La.—How did the 5 meters come out?

Mr. Whitcomb—All right.

Mr. G. G. Ramsdell, New York City—I was never inspected but once, but had rather a nervous time at that period. I think most of the suggestions made are very good. I can readily understand some of the difficulties which will arise when you undertake to set a standard for the solution of the much vexed question of candle power. A good many years ago when I had charge of the company at Vincennes, Ind., I had the misfortune to have a gentleman in the City Council who was the president of one of the banks; the president of the Gas Company was president of a rival bank, and you know what that means in a small town. The gentleman in the Council had been quietly working for a long time to find some fault on the part of the gas company so that its ordinance could be annulled. I was at Cincinnati buying coal on the occasion above referred to when I got a telegram from home that "The Company was being inspected." I started back as soon as I could get away conveniently, and when I arrived there I found an inspector there, a gentleman who was the city inspector of the city of St. Louis, who had been employed by the Council at the expense of the city and instructed to bring all his apparatus and who was instructed to have nothing whatever to do with the gas company. As soon as I arrived home I hunted up the inspector to ascertain what was going on and I was very agreeably disappointed. I found the inspector, as far as I could ascertain, to be unobjectionable. I told him frankly that all I wanted was a square deal, and he told me just as frankly that all I would get would be a square deal, so we were mutually satisfied at once. That was the last I saw of him until his inspection was completed, and his public report I considered a very handsome testimonial for the company. He had inspected a large number of meters (anyone who wanted a meter inspected could have it done) and found some slow and some fast, but the average was satisfactory. The crucial test was made on the street lamps. We had an ordinance which required 5 cubic foot burners. His tests showed that some burned a little less and some a little more, but the average was slightly above ordinance requirements. The gentleman who did that work was then only an ordinary inspector, but since then he has rapidly advanced and has been the President of the Western Gas Association. I refer to Mr. Thomas D. Miller, whose report proved to be one of the best things which ever happened to our company. I think the keynote on this subject was struck when some one said that all we want is an honest inspection. If we can get that we are all right in any of our companies. I only mention this actual experience to show what might happen with unfair treatment.

Mr. A. E. Forstall, New York City—Before we can agree on a uniform system of inspection, a uniform system for testing illuminating value, we must first agree on what is the illuminating value of any particular gas. In London, which was probably the first city to put the gas companies under a rigid system of inspection, they are now, after 30 years of that inspection, still fighting over the question of what is the true illuminating value of any particular gas. The subject has been referred to a committee appointed by the Board of Trade, which is investigating the whole subject of gas testing in London, and which will make its report and recommendations as to changes in the existing system. If, after 30 years' experience in gas testing, they have not yet worked out what they consider a satisfactory, uniform system for illuminating value, we can hardly hope to settle the question in this meeting.

The President (Mr. Shelton)—Are there any further remarks on this subject?

Mr. T. D. Miller, New Orleans, La.—Since my name has been mentioned here as having been on both sides of the fence, let me say I believe the sole object of any testing is to satisfy the consumer that he is getting what he is paying for and that, if nothing but a public official inspection would satisfy him such would be the eventual solution of the problem; but my experience is that if a customer is taken properly in hand and conducted through the intricacies of the business, up to the inspection of the quality of the gas, it is not a difficult matter to satisfy him. Some may think if that is done with small customers it would be much more expensive than the maintenance of a public gas inspector, but that is not the case. The number of customers who are not satisfied, when it comes down to the fact of the matter, are really very few. I have used very successfully, and am using to-day, a large number of recording or clock meters. Of course, everyone is familiar with the clock meter, and I propose only to refer to the use I make of it. The clock meter not only checks the house meter but shows that its registration is correct on an actual consumption, which, to the consumer, is much more satisfactory than a test on a prover with air, and it also shows him exactly when he used the gas. It is often a revelation to him to find the number of hours in which his gas is being burned. A case which is quite appropos to this discussion came up a short while ago. A drug store had cut out electric light and was using two gas arc lamps and the druggist's bill was about double what it had been. It was getting along into spring and he did not understand it. I put a clock meter on for a week and had him come to the office. I told him he opened his store at 7 o'clock and closed at about 11 o'clock, and that he burned his arc lamps all day; I showed him for the hours when the store was shut the amount of consumption on the pilot lights on the two lamps, and told him I was gratified to see the arc lamps were using such a small quantity of gas. The test carried him away with admiration at the exactness of it and he said that he not only used these two lamps all day but that he burned a common jet behind the prescription desk all day. He asked how much it cost an hour for the two arc lamps. I explained the matter to him and he was perfectly satisfied. I am thinking of having a photo engraving made of that card for advertising purposes. It is a perfect record of the operation of the meter and checked perfectly with his house meter. In one of my experiences in a small place, we had a mayor who was always looking for something for political claptrap, and he got it into his head that there should be a gas inspector in the city. In conversing with him on matters concerning the gas company he said that he had made up his mind that the city must have a gas inspector so that the people would know they were getting what they paid for. I told him we would be very glad to have one. He wanted to know why, and I told him because

the greatest difficulty we had in the world was in settling disputes about gas bills, and that as a matter of fact 90 per cent. of the meters that were wrong were slow, and that if we had a public inspector his certificate as to the amount the meter was slow would be *prima facie* evidence on which we could go into court and collect our bill for the amount of gas not registered by the slow meter. He dropped the subject of an inspector. I had a similar experience in another place, made the same argument and the subject was dropped immediately. Especially will this be the case where it is prompted by a desire to produce political fireworks. After all, it comes down to the old advertising catch-phrase, "A satisfied customer is the best advocate."

The President (Mr. Shelton)—Before asking Mr. Copley to make such reply to the discussion as he desires, it seems to me we ought to get some information from our honorary members every chance we have. While this Congress has no honorary members as yet, I have no doubt that, following the example of other similar bodies, we shall undoubtedly have them, and that Mr. Forrest E. Barker, President of the Gas and Electric Light Commissioners of the State of Massachusetts, will be an honarary member of this Congress. In any event we would like to hear from Mr. Barker on this subject.

Mr. Copley—May I ask Mr. Barker to answer Mr. Thompson about the penalties in Massachusetts?

Mr. Forrest E. Barker, Boston, Mass.—As a representative of the Commonwealth of Massachusetts, I had thought that after the very flattering reference to the administration of that State with regard to gas inspection matters, there might be no reason why I should take the time of the Congress for any further explanation, but your presiding officer seldom misses an opportunity to call me up. We have been trying to work out a certain kind of refereeship between the companies and the public in Massachusetts now for a long time and in a great many directions. Prominent among all of them is the system of gas and meter inspection to which reference has been so extensively made. A word or two more in respect to it may not be out of place. We think our experience has demonstrated the great advantages of a State system of inspection over any local or municipal system. We have never had anything but a State system. There have been attempts to create a local municipal system at different times. Not long ago in one of the larger cities we had an instance of the uneasiness which arises occasionally in a local government, where they thought they wanted an independent inspector of gas for their city, and so they selected for that purpose a man who had the extremely burdensome duty of local inspector of vinegar, and he knew as much about gas as he did about the most unusual calling you could mention and no more, and the thing about which the local municipality was especially concerned was the amount of carbonic oxide in the gas and that is what they wanted him to discover. That just illustrates the tendency which might exist in the attempt to have local gas inspection. In having State inspection we have three men who spend all of their time in the inspection of gas or gas meters. These men are all graduates of the Massachusetts Institute of Technology, they are specialists in chemistry, having taken the course in that branch in the Institute, so that they are equipped in every way to command the confidence of the company as well as of the public. The chief inspector has been engaged in this work for a number of years, the assistants only for a somewhat shorter period. These men inspect all of the gas of all of the companies in the State, and with such frequency as you heard described in the paper. The inspecting in the larger companies is often done upon a bar photometer, which is located in some suitable place in the city where the gas is made. In the smaller companies the inspection is done upon a portable bar photometer of a type invented or constructed by our chief inspector, which can be readily transported, since it folds in the shape and size of an ordinary travelling trunk. It has to be made especially strong to endure the transportation, and the life of a contrivance of that kind is only two or three years, but it answers the purpose admirably and can be set up in any house or on the premises of the company. As to the frequency of the tests, there has been within the last two years vested in our Board a discretion which allows us to inspect the gas more frequently than before, and the number of inspections named in the paper read by Mr. Copley is the minimum number that can be made. That law was put into its present shape largely because there are certain companies in the State so small that they are only inspected twice a year, and if it happened that the inspector came at an unusual time—he always came unexpectedly—their gas might be below the standard, below the ordinary conditions, and the inspection was unfair to the company, and did not give, in fact, to the public in that locality a fair indication of the gas they were using. It was to give a fairer opportunity for ascertaining more accurately what was the usual value of the gas that the change was made. It also meets the other suggestion made, that if gas was only inspected once a week, having been inspected on Monday, perhaps, the chances were that the rest of the week it might be poor. With respect to the penalties about which inquiry has been made, there is no penalty for a single misfeasance—there must either be 3 consecutive instances where the gas is below the standard, or there must be 3 instances within 30 days. You will see, with respect to the second alternative, that the gas of a large company might be inspected every week—that would be 4 times, perchance 5 times, within 30 days, and there might be no 3 consecutive instances where it fell below the standard, but there might be 3 instances within the 30 days which would make the company liable to a penalty. Now we have been carrying on this work with a great deal of satisfaction to the public and the companies, I think, in spite of the controversies referred to and in spite of the debate as to whether we ought to use the sperm candle or some other standard. The fact is that any system of inspection of a public character must have for its standards those which receive the public commendation. The advantage of the whole thing is to give to the public an idea of the kind of service they are receiving from the companies. They fully understand it only when the result is expressed in terms with which they are familiar. We inspect not only for candle power, but also for impurities. Our inspectors look for sulphur, ammonia and sulphuretted hydrogen. The law fixes the limit of 20 grains of sulphur in every 100 cubic feet of gas and 10 grains of ammonia. If there is any sulphuretted hydrogen that comes in for criticism, whether it be little or much. We do not undertake to determine the amount of it, but as to whether or not it is present. I find that the companies in Massachusetts rely very largely, too largely, perhaps, upon the information which they receive from the Board to discover what quality of gas they are making. It is our practice, since the purpose of our administration is not to punish companies, but to secure the best kind of administration on their part, to send them immediately after the inspection a statement of the result. If the gas is inspected to-day, tomorrow the company receives a postal card stating just what candle power was found. The determination of the amount of sulphur and ammonia is made later. A sample of the gas is taken to the laboratory of the Board, and once a week the determination of sulphurs and ammonias is made at that place, and then the information is at once sent to the companies concerned. If there is any sulphuretted hydrogen in the gas the information about that is sent at the same time the information is sent about candle power, because that determination is so easily made. With respect to the amount of the penalty, that is a fixed figure, a fine of $100. It is payable to the municipality within which the company does business and may be collected by the representatives of the city or town. The number of instances, taking all the companies in the State, which occur in any one year are very few. I do not think I can tell you how few, but frequently not over a dozen in all of the companies in the State in a whole year. There are periods when, as in the last couple of years, there has been extraordinary trouble about coal, and the cases of sulphur and sulphuretted hydrogen have been more numerous than usual, but that condition is now being met by modifications in the method of purification. I do not know that there is anything more with which I ought to take the time of the Congress. I might, however, refer to the matter of meter testing. The testing of meters is for the most part done by two men, not the men to whom I have already referred. These men are principally engaged in inspecting gas, and only test meters on emergency calls, that is to say, when there is an unusual amount of work which demands prompt attention. The fees for the testing of meters, however, pay the expenses of the entire inspection department. Our expenses last year were in the neighborhood of $11,000. We pay to our chief inspector $2,500 per year; the first assistant inspector, $1,500 per year; second assistant inspector, $1,200 per year, and we pay the two inspectors of meters about $1,000 a year each. The other expenses are for travelling. The 25-cent fee for the smaller meters and a somewhat larger fee for the larger meters, according to their size, pays the entire expenses of the department, and we have a balance of $600 or $700 a year, which goes into the treasury of the State and is used to reduce the other taxes of the companies. With respect to the testing of meters, the great bulk of it is done at the factory where the meters are made. We have a meter manufacturing establishment in Massachusetts, which does most of the supply and repair business in the State. The owners, who are very courteous to us, provide us with a room at their works with the necessary provers and our two men are working there nearly all the time. They also provide us with a power method of manipulating the meter provers, so that a large number of meters are tested every day. Our men at the works will test on an average from 150 to 175 3 or 5-light

meters in a day, the larger sizes, of course, in proportion. If the meters are bought out of the State they are shipped by the manufacturer to the office of the gas company, and we send a man there to inspect them. Every company above a certain size is required to have on its premises meter provers that have been tested by our department so we can there examine the meters bought from manufacturers outside the State. All repaired meters must under our law be re-tested and re-sealed before they may be reset. As in the case of the new meters the bulk of the repaired meters are found at the factory. Of course, meters coming into the State from other manufacturers are repaired by them, if they need repairing, are returned to the office of the gas company and inspected there by our inspectors the same as they would inspect the new meters.

Mr. T. D. Miller, New Orleans, La.—Is there any difference in the penalty in case the quality of the gas is not up to the requirements, provided that poor quality is the result of some casualty at the plant?

Commissioner Barker—There has always been a discretion in respect to the enforcement of penalties. When we find a company has become liable to a penalty upon the face of the returns, we do not proceed immediately to the imposition of the penalty. We report the matter to the Attorney-General of the Commonwealth, who exercises his discretion. We are obliged, at the same time that we notify the Attorney-General, to notify the company, and they are perfectly competent to look after their interests in the Attorney-General's office. I have never known the collection of a fine where the circumstances were such as Mr. Miller's question implies. If the Attorney-General believes the penalty should be enforced he sends a communication to the local authorities, the town or city counsellor, the attorney who looks after their affairs, and in that way the company is obliged to make its peace with the local authorities.

President Shelton—I am sure the applause which greeted Commissioner Barker's remarks is the best appreciation we can tender to him of our thanks for his remarks. Those of us who become interested in this subject in the future can, by turning to the record of his remarks, no doubt get a great deal of information of very much value.

Commissioner Barker—I will supplement my remarks by saying that we shall be glad to answer any correspondence at our office on this or any other line. We have a great many inquiries from managers throughout the country, I may say throughout the world, and we are always pleased to answer inquiries and to give the best information which is at our command.

The President (Mr. Shelton)—I will ask Mr. Copley to close the discussion on this paper.

Mr. Copley—In answer to the statement of Mr. Shelton's personal experience, if I may be permitted to make a suggestion, I will suggest that he do as I have done—apply to the Massachusetts Commission and turn over their records to the municipal authorities, and if they will spend one minute's time in looking over these records you will be amply rewarded for the trouble taken, as anyone who will give the records an impartial study will be convinced. Regarding the question asked by the gentleman from Philadelphia, Mr. Barker covered the point relative to the penalties. As to Mr. A. S. Miller's objection, as we all know, he represents one of the six largest systems in this country. It is practically impossible to have an arrangement that is going to be satisfactory and equitable without being too expensive, unless the companies in the larger cities bear a small part of the burden of the smaller cities, just as the U. S. Government recognizes that principle in its postal laws. I will guarantee that the U. S. Government can deliver any letter mailed to a citizen in the city of Baltimore for a half cent, and if you want to deliver a letter from a citizen of Baltimore to a citizen of San Francisco, the U. S. Government will lose money on it, yet they charge 2 cents for each letter delivered in Baltimore for the purpose of making uniform rates and laws throughout the country, and for the reason that it works no great hardship. This question of making State inspections involves that same principle. I would like to supplement Mr. Barker's remarks by stating it was my good fortune at one time to have studied law. I know that the laws of the State of Massachusetts are held up to every law student as being models of their kind in this country; and after spending several months studying the reports on this subject of inspection as practiced in the State of Massachusetts, I want to say I believe these regulations are far-and-away in advance of anything and everything of a similar character in this country at the present time.

The President (Mr. Norris)—We are greatly indebted to the gentleman for the paper, and the discussion thereon, and I am sure that a vote of appreciation for the papers which have been read at this session is in order.

Mr. Paul Thompson—Mr. Chairman, I move that the hearty thanks of the Congress be extended to Messrs. Shelton and Copley for the very valuable papers which they have presented to the Congress. [Seconded and carried.]

The President (Mr. Norris)—I will call attention to the fact that tomorrow the programme will be particularly interesting, including, as it does, a paper on "Gas Association Work," by Mr. Henry L. Doherty, New York City, and one on "Station Meters," by Mr. Donald McDonald, Albany, N. Y. In addition to these two a subject down for discussion, is on the proper size of retort to be used in carbonizing gas coal. The session will be from 10 o'clock until 2 o'clock, and we would particularly like to have everyone present promply, as the first paper, by Mr. Doherty, will undoubtedly be very interesting.

ROLL CALL.

The following persons were in attendance:

Adams, H. E., Stockton, Cal.
Aldrich, W. A., Spokane Falls, Wash.
Ambler, T. M., St. Louis, Mo.
Arkwright, P. S., Atlanta, Ga.
Atwood, W. A., Flint, Mich.
Baehr, W. A., St. Louis, Mo.
Bailey, Wm , Oskaloosa, Ia.
Baldwin, W. S., St. Louis, Mo.
Barker, F. E., Boston, Mass.
Battin, H. S., Philadelphia, Pa.
Beal, T. R., Poughkeepsie, N. Y.
Beardslee, C. S., Cleveland, O.
Beck, Geo. W., Sunbury, Pa.
Bedard, F. W., La Salle, Ill.
Berkley, J. M., Bloomington, Ill.
Beyerle, W. P., Council Bluffs, Ia.
Bigelow, L. S., New York City.
Bixby, H., Quincy, Ill.
Bixby, W. A., Quincy, Ill.
Blauvelt, W. S., Detroit, Mich.
Boardman, A. E., New York City.
Bowen, F. W., Kenosha, Wis.
Bowers, W. L., Davenport, Ia.
Brainard, D. C., Carthage, Mo.
Bredel, F., Milwaukee, Wis.
Brill, A. B., Pittsburg, Pa.
Brown, E. C., New York City.
Brown, W. E., New Westminster, B. C.
Buck D., Coatesville, Pa.
Buck, E. H., Vincennes, Ind.
Buckley, J. C., Chicago, Ills.
Busch, J. L., Decatur, Ills.
Calkins, W. B., St. Louis, Mo.
Carpenter, H. A., Pittsburg, Pa.
Carter, T. B., St. Louis, Mo.
Cartwright, H. R., Philadelpha, Pa.
Case, C. A., Chicago, Ills.
Cathels, E., Providence, R. I.
Chollar, B. E., Kansas City, Mo.
Clabaugh, G. W., Omaha, Neb.
Clapp, G. N., Middletown, O.
Clark, J. C. D., St. Louis, Mo.
Clarke, G. S., Kansas City, Mo.
Cobb, S. P., St. Louis, Mo.
Coggshall, H. F., Fitchburg, Mass.
Collins, C., Elkhart, Ind.
Collins, D. J., Philadelphia, Pa.
Collins, W., Stamford, Conn.
Colvin, J. E., Muncie, Ind.
Combs, R. B., Philadelphia, Pa.
Connelly, J. S., Parsons, Kas.
Cooper, W. H., Amsterdam, N. Y.
Copley, I. C., Aurora, Ills.
Cosgrove, W. L., Atlanta, Ga.
Cowdery, E. G., St. Louis, Mo.
Crawford, E., Sterling, Ills.
Crawford, T., Sterling, Ills.
Crane, W. M., New York City.
Cressler, A. D., Fort Wayne, Ind.
Crissfield, J. A. P., Philadelphia, Pa.
Cutcheon, M. H., Appleton, Wis.
Daly, A. J., St. Louis, Mo.
Daniels, J. M., Columbia, S. C.
Dawson, G. H., Springfield, Ills.
Day, C. L., Chicago, Ills.
Dean, M., New York City.
Deli, J., St. Louis, Mo.
Diall, M. N., Terre Haute, Ind.
Dickel, C. A., Philadelphia, Pa.
Dickey, C. H., Baltimore, Md.
Dielman, P. J., Topeka, Kan.
Doan, F. M., Jacksonville, Ills.
Doherty, H. L., New York City.
Doty, P., St. Paul, Minn.
Dougherty, D. J., Jacksonville, Fla.
Dunbar, J. W., New Albany, Ind.
Duncan, F. C., Galesburg, Ind.
Dunn, F. S., Albany, N. Y.
Dutton, L. R., Jenkintown, Pa.
Dutton, R. H., Hanover, Pa.
Earnshaw, E. H., Philadelphia, Pa.
Eaton, A. B., Chicago, Ills.
Elbert, V. L., St. Paul, Minn.
Elliot, H. J., Chicago, Ills.
Ellis, J. W., Woonsocket, R. I.
Eustace, E. W., Peoria, Ills.
Eustace, J. H., Chicago, Ills.
Finnegan, A., St. Louis, Mo.
Fitzgerald, J. H., Houston, Tex.
Fitzgerald, L., Waukegan, Ills.
Forbes, C., London, Ont., Can.
Forbes, J., Chattanooga, Tenn.
Forstall, A. E., New York City.
Forstall, W., Philadelphia, Pa.
Frazer, D. H., Battle Creek, Mich.
Gerould, C. L., Galesburg, Ills.
Gibbons, J., Jr., Penn Yan, N. Y.
Gibbons, P. H., St. Louis, Mo.
Gimper, E. H., New Orleans, La.
Gimper, J., Galveston, Tex.
Glass, S. J., New York City.
Goodnow, G. F., Waukegan, Ills.
Gould, J. A., Boston, Mass.
Gribbel, J., Phialadelphia, Pa.
Guldlin, O. N., Fort Wayne, Ind.
Gummer, H. R., Dayton, O.
Haase, E., Milwaukee, Wis.
Hadden, J. M., Poughkeepsie, N.Y.
Haines, J., Des Moines, Ia.
Hammatt, C. S., Jacksonville, Fla.
Harper, H. D., Chicago, Ills.
Hartman, W. E., Joliet, Ills.
Hayward, S. F., New York City.
Heffern, C. S.
Helme, W. E., Philadelphia, Pa.
Henderson, C. E., Milwaukee, Wis.
Hessenbruch, G. S., St. Louis, Mo.
Hicks, G. C., Jr., Connersville, Ind.
Holman, C. L., St. Louis, Mo.
Hopton, L. R., New York City.
Horton, T. O., Stapleton, N. Y.
Howard, J. B., Galena, Ills.
Humphrey, A. H., Kalamazoo, Mich.
Hurlburt, A., Philadelphia, Pa.
Hyde, H. H., Racine, Wis.
Jacobs, C. H., Detroit, Mich.
Johnston, E. D., Connersville, Ind.
Jones, E. C., San Francisco, Cal.
Jones, J. O., St. Louis, Mo.
Jones, T. C., Delaware, O.
Kahn, L., Hamilton, O.
Keller, C. M., Columbus, Ind.
Kelley, F. W., Davenport, Ia.
Kellogg, L. L., Sioux City, Ia.
Kellum, B. J., Chicago, Ills.
Kersting, A. F., Pittsfield, Mass.
Kincaid, H. E., Jackson, Tenn.
Knight, J. J., Kalamazoo, Mich.
Lakin, D. L., St. Louis, Mo.
Lakin, S. W., Topeka, Kans.
Lane, F. K., East St. Louis, Mo.
Lea, H. I., Chicago, Ills.
Learned, C. A., Meriden, Conn.
Learned, W. A., Newton, Mass.
Leavenworth, M., St Louis, Mo.
Leonard, W. H., Chicago, Ills.
Light, G., Dayton, O.
Lindsay, C. R. Jr., Chicago, Ills.
Lorenz, J., Jackson, Miss.
Lotz, A., Chicago, Ills.

Lovett, E. C., Chicago, Ills.
Lynn, J. R., Waterloo, Ia.
Lyons, B. F., St. Louis, Mo.
McDonald, D., Albany, N. Y.
McDonald, D., Louisville, Ky.
McDonald, W., Albany, N. Y.
McIlhenny, J., Philadelphia, Pa.
McIlhenny, J. D., Philadelphia, Pa.
Macbeth, A. B., Kansas City, Mo.
Madsen, O. R., Chicago, Ills.
Magee, R. S., Cincinnati, O.
Mansur, J. H., Royersford, Pa.
Mason, C. H., Bloomington, Ills.
Marshall, F. L., Centralia, Ills.
Martin, J. H. T., New York City.
Martin, W. W., Chicago, Ills.
Middleton, R. L., Washington, D.C.
Miller, A. S., Baltimore, Md.
Miller, F. A., Bradford, Pa.
Miller, T. D., New Orleans, La.
Mitchell, K. M., St. Joseph, Mo.
Mockett, W. E., Dallas, Tex.
Morava, W., Chicago, Ills.
Mordue, T. N., Chicago, Ills.
Morrell, E. E., Chicago, Ills.
Moss, Dr. R. S., Chicago, Ills.
Mueller, E. B., St. Louis, Mo.
Mueller, H., Decatur, Ills.
Mueller, O., Decatur, Ills.
Mueller, R., Decatur, Ills.
Murdock, J. W., Joliet, Ills.
Nettleton, C. H., Derby, Conn.
Norris, R., Philadelphia, Pa.
Norton, H. A., Boston, Mass.
Olds, H. L., Lincoln, Ills.
Osborn, H. H., Chicago, Ills.
Osius, G., Detroit, Mich.
Parker, G. W., New York City.
Patton, W. H., Chicago, Ills.
Perkins, B. W., South Bend., Ind.
Persons, F. R., Toledo, O.
Powell, W. R., Columbus, O.
Pratt, E. G., Milwaukee, Wis.
Printz, C. H., St. Louis, Mo.
Purcell, T. V., Chicago, Ills.
Quinn, A. K., Newport, R. I.
Ramsdell, G. G., New York City.
Rancke, L. N., Baltimore, Md.
Reger, W. S., St. Louis, Mo.
Reilly, J. A., Cincinnati, O.
Roberts, C. F., New Haven, Conn.
Roper, G. D., Rockford, Ills.
Runner, R. K., De Kalb, Ills.
Runner, Z. T. F., Freeport, Ills.
Russell, D. R., St. Louis, Mo.
Sanderson, C. E., New York City.
Sargent, F. H., Lawrence, Mass.
Schall, H. D., Chicago, Ills.
Schmidt, E. G., Springfield, Ills.
Searle, R. M., Mount Vernon, N. Y.
Shelton, F. H., Philadelphia, Pa.
Sherman, F. C., New Haven, Conn.
Shirra, J. C., Milwaukee, Wis.
Slater, A. B., Jr., Fort Wayne, Ind.
Somerville, J., Indianapolis, Ind.
Speer, R. D., Little Rock, Ark.
Spinning, W. V., Peru, Ind.
Stacey, J. E., Cincinnati, O.
Steinwedell, G., Denver, Col.
Steinwedell, W., Quincy, Ills.
Steinwedell, W. E., Cleveland, O.
Stephens, H. H., Brookfield, Mo.
Stiles, A. K., Streator, Ills.
Stone, F. W., Ashtabula, O.
Strohn, R. N., Lagrange, Ills.
Stroud, M. W., Philadelphia, Pa.
Swann, H. R., Louisville, Ky.
Tayler, G. H., Warren, O.
Taylor, J. D., Jr., Canon City, Col.
Terhune, C. F., New York City.
Thayer, J. M., Jr., Alton, Ills.
Thompson, P., Philadelphia, Pa.
Thwing, O. O., St. Louis, Mo.
Tinsman, E. H., St. Louis, Mo.
Tippy, B. O., Detroit, Mich.
Tucker, C. A., St. Louis, Mo.
Viles, B. D., Chippewa Falls, Wis.
Von Maur, J. D., St. Louis, Mo.
Walsh, J. T., Chicago, Ills.
Waring, G. H., Omaha, Neb.
Warmington, D. R., Cleveland, O.
Watt, R., Chicago, Ills.
Weber, O. B., New York City.
Wehner, R. K., Newark, N. J.
Wells, F. K., New York City.
Whitcomb, H. D., Jr., Newark, N. J.
White, H. H., Belleville, Ills.
White, W. H., New York City.
Whitton, W. H., St. Louis, Mo.
Wickham, L., St. Louis, Mo.
Witherden, G. M., Philadelphia, Pa.
Worcester, F., St. Louis, Mo.
Young, J., Allegheny, Pa.
Young, R., Pittsburg, Pa.

An adjournment until the following day was ordered.

[To be Continued.]

On the Use of Bunsen Burners and Combustion Apparatus Without City Gas.

[Contributed to *Jour. Am. Chem. Society*, by MR. H. D. GIBBS, Oregon Agricultural College, Corvallis, Ore.]

The following is a description of an apparatus whereby Bunsen burners, either individually or in large numbers, as in the combustion furnace, are readily made available for use in laboratories devoid of gas of the proper kind and under the proper pressure.

Finding it impossible to employ the ordinary combustion furnace when the only gas available was that manufactured from gasoline by two machines, one of 150 burners capacity, supplying the general chemical laboratories, the other of 75 burners capacity, supplying the organic and agricultural chemical laboratories, owing to the fact that not more than 4 burners in the combustion furnace could be lighted at one time, even though the machines appeared to be giving as good gas and under as great a pressure as is usual in generators of this character, I was forced to attempt the employment of some other easily manufactured gas, obtainable quickly and in large quantities, avoiding the necessity of large storage tanks and which could be burned in Bunsen burners. For this purpose gases derived from boiling gasoline, benzine, ligroin, kerosene, methyl alcohol, ethyl alcohol and mixtures of waste solvents from the organic laboratory were employed in different forms of apparatus with varying success.

Most satisfactory results were obtained by boiling the liquid in a copper boiler of about 4 liters capacity (a gallon kerosene can was first employed, but was found to be of insufficient strength and durability) and passing the vapors directly into the Bunsen burners.

Fig. 1 shows the apparatus as employed with the combustion furnace.

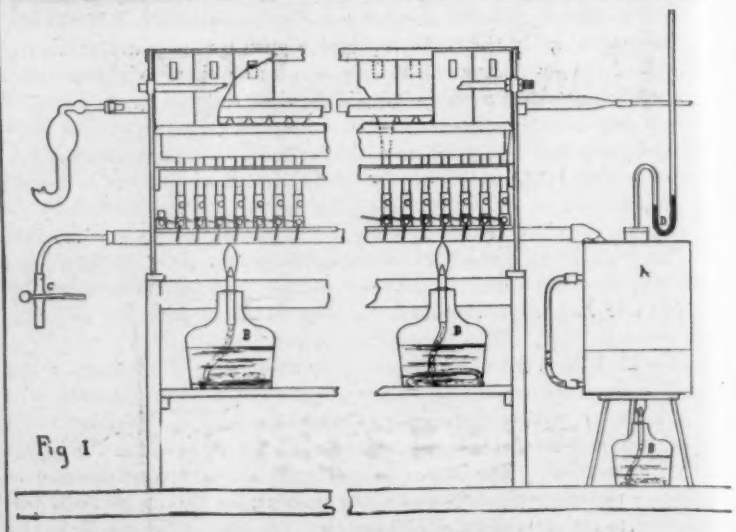


Fig 1

The copper boiler, *A*, is fitted with a gas outlet tube leading directly into the gas tube of the combustion furnace, a manometer, *D*, and a gauge to show the height of the liquid. The alcohol lamps, *B*, supply heat for vaporizing the liquid and warming the tubing and burners, thus avoiding condensation. The pinch-cock, *C*, is opened while air is being expelled and the tubing is warming. When the air is displaced, one or more of the Bunsen burners are opened, the pinch-cock is closed and the burners lighted.

Gasoline boiling above 60° C., benzine above 80°, ligroin above 100°, and kerosene above 140° produced a smoky flame, and all efforts to alleviate this difficulty by the introduction of more air were unavailing. Even in the blast lamp a colorless flame could not be produced with the vapors of these liquids. Moreover, the use of low boiling paraffins is accompanied by considerable danger unless great care is exercised. It is believed, however, that the vapors of these liquids could be employed in specially constructed burners having an extremely fine hole for the gas outlet.

Commercial grades of methyl and ethyl alcohol (95 per cent.) were found admirably adapted to the purpose.

The vapor of either alcohol was capable of producing more heat than would perhaps ever be required in the combustion furnace. The size of the flames is very easily regulated and kept constant by the rate of ebullition of the alcohol in the boiler. The adjustment can be made to a nicety when numbers of burners are operated at the same time, and with a little practice even one burner can be used, but the size of its flame will vary rapidly as the pressure in the boiler varies.

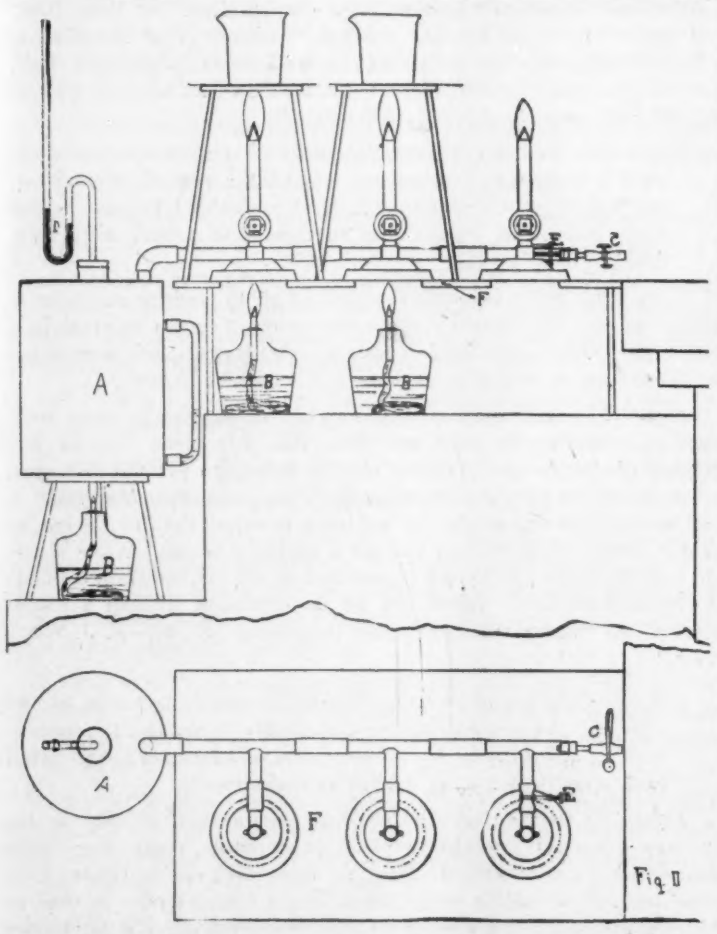
When the alcohol once reaches the boiling point, but very little heat is required to produce all of the gas necessary for a 24-burner furnace, and in no case did the pressure, shown by the mercury manometer, indicate over two mm. pressure. Usually the pressure was so small as to be hardly visible in the mercury column. Sufficient gas is readily obtainable from one generator for the running of several furnaces at the same time.

The heat for vaporizing the alcohol and warming the tubing conducing the same to the point of ignition can be obtained from alcohol lamps, thus eliminating the necessity of any other form of gas machine. I have employed the apparatus in this way with very satisfactory results, but usually found it more convenient to use, as a source of heat for vaporizing the alcohol and warming the tubing, the low pressure gasoline gas from the gas machines.

The apparatus was also found adaptable for use in isolated burners where no gas of any description is available.

Fig. 2 shows the apparatus as employed in this way. The copper boiler is fitted as in Fig. 1, the gas outlet tube leading directly to the Bunsen burners. The pinch-cock *C* is opened while the air is being expelled from the tubing. When alcoholic vapors issue strongly, the pinch-cock is closed and the burners lighted. *D* is a mercury manometer showing the pressure in the boiler.

No difficulty is experienced in adjusting the size and regularity of the flame produced if one burner in addition to the number in actual use is kept lighted. By means of the screw pinch-cock *E*, controlling the flow of gas into this extra burner, the flames in actual use can be adjusted within narrow limits. Such a screw pinch-cock may be employed for each burner. The sheet steel plate *F*, at the height of the laboratory table, is perforated at desired points with holes over which the Bunsen burners are placed in position to be readily warmed by small flames from the alcohol lamps *B*.



The chief advantage of the apparatus for laboratories remote from city supplies of gas is: The almost immediate availabilty of an unlimited, cheap supply of gas, capable of producing any desired degree of heat in the combustion furnace or in isolated Bunsen lamps.

My students find no difficulty or danger in employing the apparatus for all work requiring the combustion burners.

I have Mr. C. W. Beaver to thank for assistance in the preliminary experimentation.

[Concluded from Page 132.]

Contents of the Question Box as Read at the Twentieth Annual Meeting, Ohio Gas Light Association, Cleveland, O., March, 1904.

No. 84. "When the fuel contains appreciable quantities of hydrogen, as in a newly stoked coke fired bench, or at all times in a coke fired bench, the analysis cannot be proved by the method noted in the last question. Is there any way of doing it?"

"If, as in an ordinary coke fired bench, with water in the ash pan, the chimney gas is found to contain no CO, H_2, or hydrocarbons, the following rule can be used for a check: The free O_2 found indicates the volume of excess air ($O_2 + aN_2$). N_2 found, less N_2 calculated from O_2 found, is 79-100 (79 per cent.) of air consumed by fuel. From this air calculate O_2 consumed. Deduct from this O_2, the O_2 in the CO_2 found (or simply deduct the volume of CO_2 found). From the remaining O_2 calculate the H_2 in combination. This is not so complicated as it seems It also affords a direct means of examining chimney products in a furnace fired by illuminating gas, and thus—or by combustion in a Drehschmidt—makes easy the ultimate analysis of illuminating gas.—H. B. Harrop."

No. 85. "Is there any quicker method of determining total sulphur in coal than the Eschka?"

Yes; by the use of peroxide of sodium, Na_2O_2, as an oxidizing agent and then proceeding by the regular gravimetric determination for SO_3. —Howard E. Mann.

"In *Jour. Am. Chem. Soc.*, February, 1903, there was a paper by Sundstrom (marked, received November 26th, 1902), giving a quick combustion by sodium peroxide in a special cartridge. Prior to this I had used the cartridge of the Parr calorimeter and sodium peroxide for this purpose, and had a paper before the McMillin Companies Managers' Association, read at the New York meeting, October 14th, 1902, in which the method was fully described. This process, which is now generally known as the Sundstrom method, has recently been modified by Pennock and Morton (*Jour. Am. Chem. Soc.*, December, 1903), by combining with it the Andrews titration scheme for estimating the sulphuric acid found. This volumetric modification is of dubious merit, but the peroxide combustion is a vast improvement over the Eschka.—H. B. Harrop."

"The old-fashioned method is in common use for the determination of total sulphur in coal and coke, and is somewhat quicker than the regular Eschka method, but must be watched more closely at the start. It consists of fusing up 1 gramme of the coal or coke sample with about 9 grammes of sodium carbonate and 5 grammes of potassium nitrate. A full description of this method can be found in any good quantitative text book. A rapid method for the determination of sulphur in coal and coke is described in the American Gas Light Journal, January 11, 1904.—W. B. Calkins."

"See 'A Rapid Method for the Determination of Sulphur in Coal and Coke,' by Pennock and Morton; American Gas Light Journal, Jan. 11, 1904.—Donald Davidson."

No. 86. "When the amount of sulphur left in the coke is of no consequence to the gas company, why is it not the only proper test to subject the coal sample to distillation on a small scale, but under conditions similar to retorting in regular practice, and determine the sulphur in the volatile matter?"

"There is no objection to this method if the amount of sulphur left in the coke is of no consequence; but as a matter of fact the amount of sulphur left in the coke is of very great importance in a large majority of purposes for which coke is used—viz., in water gas generators, the heating of iron, steel, etc., and also domestic purposes.—Paul Doty."

No. 87. "Besides the two obvious expedients of frequent steaming, and more gradual cooling by the use of extra condensers, is there any way to prevent the accumulation of quantities of ammonium carbonate in the water condensers of a coal gas condensing system?"

No. 88. "In average good practice, what fraction of a pound of ammonia per 1,000 feet of gas is found to escape the scrubbers?"

"In good practice, 5 to 6 grains per 100 cubic feet to keep the purifying boxes alkaline.—Howard E. Mann."

"In good practice practically no ammonia is allowed to escape the scrubbers. Some ammonia, however, is held in suspension in the tar of the hydraulic main and never reaches the scrubbers.—Paul Doty."

No. 89." From the reaction $FeSO_4 7H_2O + CaO$, etc., it seems that 1-5 lb. quicklime will convert 1 lb. copperas into ferrous oxide. Why do most of the formulæ used in gas works prescribe 1, 2 and sometimes 3 lbs. quicklime to one of copperas? Is this lime intended to fulfil any other purprose than to convert the iron of the copperas into a form where it will readily absorb H_2S?"

"To keep the purifying boxes alkaline, so as to absorb as much of the CS_2 as possible. The compound of iron formed is primarily the ferrous hydrate which is readily transformed into the ferric hydrate.—Howard E. Mann."

"It is found in practice that hydrated iron oxide should be in an alkaline condition for most effective absorption of H_2S. The excess line tends to maintain this alkaline condition.—Paul Doty."

No. 90. "To what extent is lime purification (for CO_2) used in this country? Foul lime (for CS_2)?"

No. 91. "What are the conditions governing the absorption of CS_2 by foul oxide—in terms of age, sulphur content, percentage of moisture, time, etc.?"

"From experiments made in the Milwaukee east side works I have concluded that the CS_2 absorbed in the boxes decreased with the temperature and the moisture, and increased with the amount of H_2S, the amount of air, the length of time allowed for revivification, the total amount of sulphur in all the boxes, and especially with the amount of sulphur in the first box, and with the frequency of revivification. One test lasting 48 hours indicated an absorption of 56 per cent. of the CS_2 entering the boxes. It should be stated that this material was frequently revivified *in situ* by the steaming method—air drawn through the idle boxes by means of a steam siphon.—H. B. Harrop."

No. 92. "What is the source of the ammonia which sometimes appears in water gas purffying boxes?"

"Where the water gas machine is not thoroughly purged when each run is put on, a small amount of air may be left in it. The nitrogen in this air would combine with the nascent hydrogen produced in the generator, and the product would be NH_3. Free hydrogen will combine with nitrogen when the temperature is high enough, as it is in the water gas apparatus. This fact may be found in any advanced chemistry, as 'Remsen's.'—E. J. SHERWOOD."

"Inasmuch as a considerable proportion of the total ammonia in coal remains in the coke, I should say the ammonia here referred to may be traced to this source.—HENRY I. LEA."

No. 93. "To avoid frequently dismantling and cleaning the take-off pipe of a Lowe water gas set, would it be practicable to make such changes as would carry the blast through this pipe, instead of directly from the superheater through the roof?"

"It is practicable to carry the blast through the take-off pipe, provided the operation is performed often, as there is considerable danger of overheating the pipe if too large an amount of carbon is allowed to accumulate.—E. J. SHERWOOD."

"The scheme is practicable, but too expensive. It has been tried on a Springer set, and while keeping the take-off pipes perfectly clean, the intense heat produced caused the pipes to warp and crack, necessitating their renewal twice during a period of less than a year.—M. E. MALONE."

No. 94. "Why cannot hard clinkers be prevented in a water gas generator by admitting a small percentage of steam with each blast, and can sufficient steam be used to accomplish this result in actual practice without upsetting the heat equations?"

"The objection to this plan is that the steam would be decomposed, forming combustible gas, and thus defeat the object of cooling the clinker.—PAUL DOTY."

No. 95. "What is the value of 45° crude benzol as an enricher for coal gas compared with crude naphtha and distillate?"

"A paper by Mr. A. Lecomte, of Paris, published in the AMERICAN GAS LIGHT JOURNAL, July 28th, 1902, page 110, will perhaps throw some light on this ques(ion.—W. M. SITES."

No. 96. "Can anyone give an actual experience with isolated generators in relation to coal gas bench work?"

No. 97. "Can anyone give actual experience in the operation of any power plant, whether in a gas works or electric station, by means of producer gas?"

No. 98. "What is the most successful and economical producer on the market to-day? What is the essential principle which determines its economy?"

The Pintsch producer, which will be on exhibition at the St. Louis Fair, is one of the highest types of producers for gas engine work.—PAUL DOTY."

No. 99. "Is there any reason why a producer should not be run at the highest possible tenston; that is, at an extremely high blast pressure, if clinkering can be prevented?"

No. 100. "How could such clinkering be prevented, and what effect would such high tension running have upon the capacity per unit of area or unit of mass of the producer?"

A 1. "What effect would such high tension running have upon the total efficiency of the producer as compared to low tension running?"

A 2. "What kind of fuel is best adapted, in general, for producer gas work?"

"The smaller sizes of anthracite coal.—PAUL DOTY."

A 3. "Is naphthaline formed anywhere but in the retorts?"

"Naphthaline is formed by the action of heat on organic substances, but only at rather high temperatures. Tar that is formed at low heat does not contain it at all, and the only place where it could be formed in gas making is in the retorts.—W. B. CALKINS."

"If the question refers to coal gas alone, the answer is naphthaline is formed in retorts only.—JOHN GIMPER."

"Naphthaline can be formed in a water gas machine if too high heats are carried in the superheater.—E. J. SHERWOOD."

References: Paper on "Formation of Naphthaline," by Paul Doty, read before the 22d annual meeting, Western Gas Association, and published in the AMERICAN GAS LIGHT JOURNAL, June 26th, 1899, page 967; discussion published in the AMERICAN GAS LIGHT JOURNAL, July 3d, 1899, page 2.—J. CHAS. ANDREWS."

A 4.—Why does no explosion take place when the seal in hydraulic main is broken, and exhauster is taking a vacuum of 2 inches, and a fire at end of standpipe? If no explosion takes place under above conditions, why are we so careful of a dead main as to fire?"

"There must be a considerable surplus of air to produce an explosive mixture of gas, and there is much more chance of such a mixture in a dead main. One takes a long chance in permitting any mixtures of gas and air to form in proximity to flame.—WALTER M. BLINKS."

"There is probably not a sufficient supply of oxygen to allow combustion to travel up the standpipe farther than a few feet. The gas and products of combustion traveling up the standpipe put the flame out, unless enough oxygen can be taken along to produce combustion. A dead main, when exposed to the air, tends to empty itself of the gas, as the gas is lighter than the air and has a tendency to rise. After a certain amount of the gas has been displaced by the air, the main contains an explosive mixture. There can be no explosion without a proper mixture, no matter whether a fire is present or not.—E. J. SHERWOOD."

A 5.—"What would you do if called hurriedly to works to find over half the water in commercial holder gone, and the balance rushing down the valley below works, and no other holder to fall back upon (water being held in by masonry)?".

"Assuming that a large crack had suddenly developed in the masonry, I should arrange to place paper sacks, containing finely broken lime, in or directly in front of this crack on the inside. The paper must, of course, be rather tough, and a special device be used in lowering the sack and releasing it at the proper point. The bag should then be broken open and the water, on going through the crack, will wash the lime in. Gradually the lime will lodge and swell, thus closing the crack temporarily. If the cracks are but small this may be used as a permanent remedy. Supposing that a large stone has in some way been released and a column of water is gushing through, I should lower a heavy screen, covered with coarse canvas (the canvas itself being cemented between layers), down on the inside of the tank until directly over the opening. In this way the leak could be stopped temporarily while repairs could be made from the outside. It might be found necessary to brace the refilling from the outside until the cement had thoroughly set.—HENRY I. LEA."

A 6. "How may we best decide the time, economy on all sides considered, at which it becomes unprofitable to run a bench before shutting down for repairs?"

"The proper time to shut down a bench for repairs is when the cost of maintenance becomes more than the rate of depreciation of a new setting.—PAUL DOTY."

"Whenever the loss occasioned by leakage, falling off in capacity and excess of fuel required may be sufficient to pay for the repairs or renewals in about one year.—J. H. HAGERTY."

A 7. "Would the constant jarring of heavy trains, where gasholder is situated near the tracks, be injurious to the masonry of holder, thus causing it to leak? What could be done to stop the leak?"

"The writer knows of two brick holder tanks, that have stood for 10 and 20 years respectively, within 50 feet of two main lines of railroad upon which heavy trains are constantly passing at high speed. The masonry is uninjured and tanks perfectly tight. The soil is sandy but subject to considerable jar, as in excavatiug for last tank built a cave-in occurred nearly every time a train passed.—WALTER M. BLINKS."

"I do not think the jarring of trains would affect the masonry of the holder tank. Our holder tank, consisting of a brick wall cemented, is so situated that there is a railroad track about 4 feet from one side of the tank and another about 20 feet from the other side, and these tracks are in daily use and have been for a number of years. About 5 years ago we had occasion to empty our holder tank and could find no leaks in the cement which would come from this cause. At the time we re-cemented our tank and have had no leakage to speak of since. Our tank was in pretty bad shape at the time before we re-cemented it, and

we used sawdust, bran and horse manure with varying success for stopping the leakage, and finally came to the conclusion that about the only sure way to stop this leakage was to empty the tank and re-cement it, which we did.—F. C. WEBBER."

A 8. "How many months' supply of coal should be stored at a gas works as a safeguard against coal strikes, which of late have been alarmingly frequent?"

"Have storage shed completely filled, then have shipments arranged so that you can receive daily what you carbonize.—E. J. CURLEY."

"It depends upon relative water gas and coal gas capacity of plant. Enough coal should be carried in stock to supply the city with gas for 3 months with the water gas plant running at full capacity. Balance of gas required by the city to be coal gas.—B. O. TIPPY."

A. 9. "How much gas can be accurately measured by a station meter beyond its rated capacity?"

"Would not care to go over 10 to 15 per cent.—E. J. CURLEY."

"Thirty-five per cent.—A. F. REITMEYER."

"It is my opinion that a station meter will register accurately until gas blows through seal between the inlet and outlet compartments of meter; or, in other words, until the differential pressure of the inlet and outlet of meter equals the seal between the inlet and outlet compartments of the meter.—B. O. TIPPY."

A 10. "What holder capacity would you recommend for a plant sending out 500,000 cubic feet per day? What is the basis used by engineers for figuring the holder capacity of plants of a given capacity?"

"In a small sized works the output and the storage capacity should be in the ratio of 1 to 1. In large works this ratio may be decreased. There are works in this country with the ratio of output to storage capacity as low as 2 to 1.—PAUL DOTY."

"If the plant is all coal gas the storage capacity should equal the average daily output during the months of November and December." If a water gas plant, I should think the storage capacity could be much less with safety. In either case, much would depend upon the generating capacity. It is wise to have more than one holder in any case, and all machinery about a gas plant should be in duplicate in order to be very comfortable.—J. J. KNIGHT."

"Holder capacity should never be less than the maximum daily send out.—W. W. FROST."

A 11. "How much oil storage should be provided for in plants of 500,000, 1,000,000, 1,500,000 and 2,000,000 cubic feet daily capacity, respectively, in towns located 500 miles from the source of supply and making water gas exclusively? What is your basis of estimate?"

"Depends somewhat upon candle power of gas manufactured. Storage should not be less than two weeks' supply.—F. TOBEY, JR."

"Estimating that 5 gallons of oil are required per 1,000 cubic feet gas made, and that there should be storage capacity for 30 days' supply, a plant of 500,000 cubic feet daily capacity should have storage capacity for 75,000 gallons oil; 1,000,000 cubic feet daily capacity should have storage capacity for 150,000 gallons oil; 1,500,000 cubic feet daily capacity should have storage capacity for 225,000 gallons oil; 2,000,000 cubic feet daily capacity should have storage for 300,000 gallons oil.—PAUL DOTY."

A 12. "What is the smallest producer plant practical for the operation of gas engines in a manufacturing plant?"

"The labor cost per 1,000 cubic feet of gas would determine this question. A plant of 50,000 cubic feet daily capacity would be about the smallest practicable.—PAUL DOTY."

A 13. "Why are the recuperator flues hotter at times when there is no apparent fluctuation in the heat of the retorts and with no alteration in the stack temperatures?"

A 14. "When it is necessary to shut down a water gas set for one hour, on account of holders being full or any other cause, what would be the approximate loss in generator fuel for different sized apparatus occasioned by such shutdown?"

"Fifty pounds coal per hour would be the approximate loss in generator fuel in medium sized sets for occasional shutdowns.—PAUL DOTY."

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, July 10th, 1904.

The Woodall-Duckham Vertical Retort.—Municipal Trading.—High Pressure Distribution.—A Glasgow Report on Public Lighting.

For some months a new design of retort, embodying continuous charging and removal of coke, has been under experimental operation at the Bournemouth gas works. It is the invention of Mr. Harold W. Woodall, the Engineer of the Bournemouth Water and Gas Company, and of Mr. A. M'D. Duckham. The retort is vertical, comparatively large in size, and not heated regularly throughout, but from the top downwards. The heat from the furnace is first conducted to the upper part of the retort and travels through circulating flues to the bottom, and is so regulated as to be practically spent by the time the bottom is reached. The charging apparatus consists of a screw or other approved mechanical device capable of regulation, and the bottom of the retort is open and fitted with a cast iron mouthpiece, dipping below the surface of water contained in a trough, and having a flap door, which may be left wide open or partly closed to control the egress of coke, or it can be used as a rocker to facilitate the travel of the material. Below the flap is an endless band conveyor, by which the coke is carried away as fast as it issues from the retort. The ingress and egress of material, being under control, can be adjusted to suit the quality of the material being dealt with, the heat of the retort and the quantity or quality of the products. The retort is worked under sufficient exhaust to draw in the steam from the coke as it is quenched in the water trough. Ascending up to the hottest parts of the retort, it is decomposed with the production of water gas. The process is entirely inclosed, and there is no escaping smoke or steam, and although the experimental plant is vertical, the retort may be at any angle sufficient to secure the passage of the material by gravity from the top to the bottom of the retort. Considerable attention has lately been directed to the advantage of introducing a current of blue water gas into coal gas retorts, as tending to reduce objectionable secondary decomposition leading to the deposit of carbon, a loss of illuminating value and the formation of naphthaline, and also as improving the quality of the gas at the expense of the tar, and this new form of apparatus lends itself conveniently to the investigation of this point amongst others. It is also possible that the inventors have in view the production at a cheap rate of what is usually known by the erroneous and objectionable title of low power gas, but may be more accurately described as a 10-candle or 12-candle gas. As is the case with many other things, there is sometimes too much sentiment about the quality of gas supply, and too little horse sense.

The difficulty with municipal trading is when to draw the line. When once the local authorities have forsaken their proper function and embarked in private enterprise, they cannot stop at any desired limit, and so a time must come when their enroachment upon the field legitimately occupied by private trade becomes so prominent as to create dissatisfaction. If they own the gas undertaking, they are expected to sell as cheaply as neignboring private companies, and perhaps cheaper. If they do not, the gas consumer has something to say when next election time comes round. And if they are to sell gas cheaply, they must follow the same course as a private company, and attend to complaints caused by defective internal fittings, supply stoves and all kinds of appliances on hire terms, and undertake cheap maintenance. And when they do this they are landed in difficulty with the gasfitters and ironmongers. There has been trouble of this sort brewing at Edinburgh for some time. The gas supply is vested in the local authority, and as is well known, they have just built a large works at Granton. Having invested a considerable sum of money, they must keep up their sales if they are to earn their interest upon it. With this laudable object in view they have opened show rooms, and put out appliances on hire. I do not believe in the gas works being worked by the local authority, but where a different decision has been accepted, the commissioners must certainly be free to work the thing to the best advantage, and to run such subsidiary departmrnts as may be necessary to that end. Further it has never been satisfactorily demonstrated that hire or maintenance injures any private shopkeepers. Assuming all the stoves to be let on hire would be sold, the trade profit on such, parceled out amongst the trade, would be very small. Take a district of 20,000 inhabitants which would probably include 30 to 40 tradesmen claiming to be gasfitters. Suppose the gas company invests £1,000 in stoves for hire. The trade profit on that sum would be about £200 after paying all outgoings, only £5 or £6 per trader. But this is a gross overstatment of the case. Most gas companies would prefer not

to be troubled with the fitting department, and their reason for taking up the hire is because people will not buy. The trade must look, not to the extent of the present hire business, but to the amount of sales effected in towns where no such department exists. In most districts the gasfitters get a larger share of business in the form of demands for utensils or for the repair of the same and such like odds and ends as was formerly represented by the occasional sale of a gas stove. Given one town where the hire and maintenance is run for all it is worth, and another where it is entirely neglected, I venture to think that on the whole the gasfitting trade has a better time of it in the first named than in the second.

The fact that the municipality sell a stove or do a job of fitting work that might have been done by an individual trader appeals strongly to the feelings of the man in the street, but as a matter of fact, directly the local authorities embark in trade the competition is just as real whatever the article sold. The profit on a million feet of gas or a million gallons of water supplied by them is just as much lost to private enterprise as the trade discount on a stove or a gas appliance. Municipal trading if it means anything at all is intended to benefit the ratepayer at the expense of private enterprise, or, in other words, to run the show at a lower rate of profit than a private company. Otherwtse it cannot justify its existence. Sometimes the loss to the individual is more evident or is more sharply felt, but the principle is the same, and if municipal trading is to be allowed to attain any important proportions it can only do so at the expense of private enterprise, which will be impoverished to a corresponding degree. The function of a municipality should, to my idea, run in the opposite direction and aim at the encouragement of expansion of private enterprise; for after all it is private enterprise that pays the rates and provides the greater half of the assessable value.

The discussion arisng out of the attention devoted to high pressure distribution, to which I referred last month, has elicited the fact that a considerable proportion of the London gas supply is distributed by forces other than the weight of the gasholder. A vein of pipe extends from Beckton to Westminster, a distance of 15 miles, comprising two lines, each 4 feet diameter, and there is a pumping station at Beckton, and also in Boosting Station, near the other end. The pressure at the outlet of the pumps is about 2 pounds per square inch, or considerably more than would be practicable with a gasholder, and a larger proportion of the gas comes straight from the works and never goes into a gasholder at all. The most promising feature about high pressure distribution, to my mind, is the prospect that it affords for at any rate reducing the proportions of the gasholders, which represent no inconsiderable part of the capital investment. And, therefore, any example where the natural elasticity of gas is turned to practical account is deserving of careful attention.

A deputation of the Glasgow Corporation have been visiting various towns with the object of inquiring into the question of street lighting, and they find that incandescent gas takes the first position even in towns where the local authorities are the owners of the electricity supply undertaking. At Leeds there are 540 miles of streets, and with the exception of 4½ miles, gas was employed. The incandescent burners are 40 to 50 yards apart in the center of the town and 80 to 100 yards in the outskirts. Governors and anti-vibrators are fixed on all lamps, the consumption of mantles is about 6 per burner per annum, and the average number of lamps per man employed to light, extinguish and keep in order is 105. The town of Bradford is lit entirely with gas, with the exception of about 50 electric lamps in the vicinity of the town hall, and the spacing is similar to that at Leeds. Anti-vibrators and regulators are also used on every lamp, and the consumption of mantles is under 4 per lamp per annum, while each lighter takes charge of 65 to 82 lamps. Both at Bradford and at Leeds there are no by-pass jets, but all the lamps are lit by means of the torch, and at both places the light is reduced at midnight. At Sheffield the lighting is entirely by gas, governors are employed on every burner, but anti-vibrators only where there is heavy traffic. The consumption of mantles per annum is about 9 per lamp, and each lighter takes 108 lamps, but a special staff attend to the burners and mantles. At Liverpool there are 185 electric arc lamps, 13,302 incandescent gas and 4,223 flat flame. The most of the lanterns are Bellamy's patent pattern, with a lighting flap at the top of the lantern, and including an anti-vibration device. Governors are used on every lantern and the consumption of mantles averages 4 per lamp per annum. Each lighter averages 109 lamps, and there is a special maintenance and renewal staff who are provided with tricycles. After describing the public lighting in London and Brighton the report concludes with a summary of the conclusions arrived at. Amongst these are a unanimous opinion in favor of incandescent gas lighting and as to the unsuitability of electric glow lamps for public lighting. There are at present 799 electric arc lamps and 14,753 gas lamps in the streets of Glasgow, and the Committee have not met with any electric lighting superior to their own. After a full enquiry, however, they prefer to do practically the whole of the public lighting by means of gas.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE proprietors of the Negaunee and Ishpeming Street Railway Company, who do most of the gas, electric and street railway service in Negaunee and Ishpeming (Mich.) districts, have saved a salary by letting go the man who had charge of the gas plant at Negaunee. The balance sheet will appear later.

THE Gas Machinery Company, of Cleveland, O., is under contract to construct a water gas set for the plant that is to be erected this summer at Glen Cove, L. I. The capacity of the set is to be 125,000 cubic feet per diem.

ALDERMAN HURLEY, of Waterbury, Conn., whose name is suggestive of golf, put a resolution before the Board some days ago, the field tenor of which was that Waterbury is entitled to and should have the benefits of dollar gas. So it should, if it can get it. Perhaps Hurley will furnish the caddies!

MR. E. B. CANTINE has been elected to succeed the late Mr. W. J. Walker on the directorate of the Municipal Gas Company, of Albany, N. Y.

MR. JAMES FINLAY, of Pontiac, Mich., has purchased the rights and properties of the Bucyrus (O.) Gas and Electric Light Company.

THE Massachusetts Board of Gas and Electric Light Commissioners has under advisement the petition of the proprietors of the Waltham Gas and Electric Light Company to inerease the capital stock in the sum of $150,000. No opposition to the proposition was made at the hearing.

CERTAIN capitalists of Corona, Cal., are interested in a scheme for the placing of a gas works in Anaheim, Cal.

THE Mayor of Lawrence, Mass.—his name is Lynch—gives it as his judgment that the city is maintaining too many street lamps of one kind or another on public account. What a judge!

MR. RICHARD S. CONGDON has resigned the position of Manager to the Frederick (Md.) Gas and Electric Company. His successor is Mr. J.V. Enright, of Washington, Ind.

THE new holder for the Company operating in and about the Rockaway section of Long Island is to be erected at Lynnbrook.

MR. R. C. CARTER, of Boston, informs us of the death, at Norwell, Mass., of Mr. Williams Barker Brooks, the evening of July 16th. Deceased, who was born in Camden, Me., Nov. 9, 1813, was for many years prominent in the affairs of the Dorchester (Mass.) Gas Light Company.

A CORRESPONDENT in Boston, Mass, writing under date of the 23d ult., says: "A peculiar accident occurred a day or so ago in the plant of the Lexington (Mass.) Gas and Electric Light Company, and I inclose you the following newspaper account of the happening: 'Walking on a bridge over a belt from his engine to oil some of the bearings, Engineer Joseph Nearey, of the Lexington Gas and Electric Company, was overcome by the heat early this morning, fell onto the whirling 4-foot belt that drives the generator and came as near death as any man ever did and lived. In addition to his personal difficulties his prostration put the town in darkness, called out the Fire Department, awakened the police, aroused the inhabitants, called out the linemen and repair gangs of the company, and gave everyone a fright. Instead of being carried into the flywheel and crushed to death, Nearey's clothing caught in the whirring wheel, and in some unexplainable manner threw the big belt off the generator pulley and dragged him under the machine. The generator instantly stopped and every electric light in Lexington was extinguished. The big engine, which drives the generator, immediately increased its already great speed and was soon running wild in the dark. The extinguishing of lights caused Joseph

Grotty, another employee, to hasten to the engine room. Hearing the mammoth engine whirring in the dark, and knowing that the generator was stopped, at great peril to himself he stopped the engine, and in a short time the cause of the trouble was discovered. Nearey will live."

THE authorities of Holyoke, Mass., have declined to vote the sums necessary to construct a storage holder. In effect they told Manager Snow that he would have to get along for another twelvemonth, with the storage facilities now at hand, and these were close to the danger point last winter.

ACCORDING to the reports submitted to the shareholders of the Lancaster County (Pa.) Railway and Light Company, it would seem that the most profitable division of its business is the gas section thereof.

AT the annual meeting of the Nantucket (Mass.) Gas and Electric Light Company the following officers were elected: Directors, H. Boone, Chas. A. Adams, D. E. Boyden and F. G. Roberts; Treasurer and Clerk, Margaret A. McElroy.

IN connection with the above it may again be mentioned that the properties of the Nantucket Company are being operated under a receiver—Mr. Charles N. Barney, of Lynn, Mass.

THE Springer syndicate's application for the right to construct and operate a plant in Webster, City, Ia., has been rejected. The authorities have decided that if a gas plant is to go in it shall be owned and operated on municipal account. Webster city now operates its water supply and electric light and power systems.

THE regular semi-annual dividend of 5 per cent. on the shares of the Cambridge (Mass.) Gas Light Company is payable to-day.

AT the annual meeting of the Milford (Mass.) Gas Light Company the following officers were elected: Directors, J. B. Bancroft, L. H. Cook, B. E. Harris, E. L. Wires, N. B. Johnson, J. N. Davis, J. E. Walker, C. F. Claflin, F. J. Dutcher and George A. Draper; President J. B. Bancroft; Treasurer, B. E. Harris; Clerk and Auditor, H. C. Tilden,

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THE Stafford Springs (Conn.) Electric Light and Gas Company has defaulted in the July interest payment on its bonds.

THE McLewee Gas Lamp Company has been incorporated under the laws of New Jersey by Messrs. D. B. Dance, F. R. Ransell and J. F. Cotter. It is capitalized in $25,000, and its headquarters are in Camden, N. J.

WRITE to the General Gas Light Company, of Kalamazoo, Mich., for a copy of its well compiled series of "Letters from Many Gas Companies Explaining How They Get and Keep the Lighting Business." It is well worth reading even if it does sound a bit like advertising.

MR. W. G. MAHAFFY has filed his accounts as receiver of the properties of the New Castle (Del.) Gas Company.

AT the annual meeting of the Municipal Gas Company of Albany, N. Y., the officers elected were: Directors, A. N. Brady, R. C. Pruyn, Jno. Bowe, Wm. McEwan, Horace G. Young, John A. Delahanty and E. B. Cantine; President, A. N. Brady; Vice-President, Robt. C. Pruyn; Treasurer and Secretary, E. Palmer Gavit.

THE Georgia Senate has passed a bill under the terms of which cities and towns in that State are "Authorized to manufacture, distribute, use and sell gas and electricity for lighting purposes, and to construct, purchase, lease, establish and maintain one or more plants for the manufacture, distribution, use or sale of gas or electricity for lighting purposes, either public or private."

"J. B. H.," writing from Springfild, Mass., under recent date, said: "The general meeting of the Northampton (Mass) Gas Light Company was held at the appointed time. The annual report was more than ordinarily fnteresting and showed thnt the Company had done much during the fiscal year. The most important improvement was the construction of a gasholder with a capacity of 300,000 cubic feet at a cost of about $30,000. A chimney 75 feet high was erected and a 60-horse power boiler was installed. There was a net increase of 18,627 feet in the length of mains laid. The Company put in 179 new services and now has 1,785 meters in use, an increase of 232 for the year. The Company has used approximately 3,900 tons of coal and made 40,214,000 cubic feet of gas, a net increase for the year of 8.4 per cent. The stockholders chose Dr. John F. Starr, Camden, N. J., and C. N. Clark, Dr. L. Clarke Seelye, E. H. Banister and H. C. Crafts, of Northampton, Directors. After the meeting of the stockholders the Directors met and organized by electing the following officers: Chas. N. Clark, President; L. Clarke Seelye, Vice-President; E. H. Banister, Clerk and Treasurer; H. C. Crafts, Superintendent; R. M. Starkweather, Asst. Treasurer; H. C. French, Auditor. The semi-annual dividend of 4 per cent. was declared.'"

AT the annual meeting of the shareholders of the Bridgeton (N. J.) Gas Light Company no change was made in the executive management thereof. Mr. B. F. Harding was reappointed Superintendent, which place he has held for 32 years.

Electrical Undertakings in South Africa.

Electricity says that one of the most important fields opening up for the introduction and extension of the electrical industry in almost all its branches is that of the South African countries, and it is one which is well worthy of being closely watched by American manufacturers and exporters in these particular lines.

A short time since an electric central station was opened at Cape Town. As the opening ceremony attention was called to the abnormal increase in the consumption of electrical energy in Cape Town, where the demands for private lighting purposes have increased to thirty-seven times their original volume, while further growth and prosperity were assured. This showing is not abnormal as applied in general to the industry in South Africa. Indeed, the general adoption of electricity throughout South Africa is one of the most remarkable features of that country's development. It is shown by the success of her electrical enterprises, and still more by their constant expansion; in the growth and installation of street-car and lighting plants in so many centers, and the formation of larger and still more comprehensive schemes, and in the eulogistic opinions expressed by those who have thoroughly studied the situation. All this has been accomplished under what have really constituted most adverse conditions, when all classes of industry were still suffering from the effects of a long and peculiarly destructive war, and the whole country being held back to a great extent by the subsequent unsettled conditions. The growth of the electrical enterprise in the past, great as it has been, is therefore but a poor criterion of the dimensions to which this industry will attain in the future.

In the past South Africa has offered an ample market for all forms of electrical plants, in which the United States has but sparingly participated. The volume of the demand has yet to be met, and it is this which will so richly repay any effort that may be made on the part of American houses to secure same.

Under every head the growth and prosperity of the electrical industry in South Africa is assured. The conditions which obtain have long rendered it almost a necessity for private consumption, while the extension of telegraph and telephone systems will alone materially enhance the demand. Electric traction has already sprung into remarkable prominence. Many are the schemes now under consideratian, or already pigeonholed, awaiting only favorable conditions to bring them to fruition.

Johannesburg is one of the latest examples in this respect, and it has been stated that next year will see the start of her electric railway system.

It is of the utmost importance that our American manufacturers should fully grasp the position in South Africa, its difficulties as well as its opportunities.

Our strongest competitor in the field is Germany, although many of the largest installations of electrical equipment have been made by American firms. One thing largely in our favor is the fact that the American engineer is very much in evidence in South Africa, and, of course, his sympathies are with American manufacturers, and it is admitted that his taste for American machinery is as pronounced as his success in installing it in the mines, and it is in this respect that other countries foresee in us very formidable rivals.

THE AMERICAN GAS LIGHT JOURNAL

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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:
New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, AUGUST 1, 1904.

The Market for Gas Securities.

The midsummer dull season is clearly on, with the usual result that quotations are nominal in that they no more than represent the opportunities taken advantage of by the scalpers. Consolidated closed to-day (Friday) at 192¾ to 193¼. A very odd bit of gossip was heard in Pine street a day or so ago to the effect that a certain well known democrat, active in politics just now, and known by name at least over the entire country, would shortly be appointed to one of the most responsible positions in the business management of the Consolidated Company. City gas bonds continue strong, and are in good demand.

Brooklyn Union is neglected, the "official" figures for it being 213 to 220. Peoples, of Chicago, is without particular change, and Baltimore Consolidated is 76 to 77. Buy some of these shares. Washington (D. C.) hangs just under the 300 mark, and Cincinnati gas is 99¾ bid. The Directors of the Consolidated Gas Company, of Baltimore, have re-elected Gen. F. C. Latrobe to the Presidency. Mr. Alten S. Miller was reappointed General Manager. There is very little doing in Lacledes, either preferred or common.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

AUGUST 1.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	192¾	193¼
Central Union, Bonds, 5's.	3,000,000	1,000	106½	106⅝
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan	638,000	..	108	112
Mutual	3,500,000	100	270	300
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. ..				
Bonds, 5's	11,000,000	1,000	107⅛	109
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	35	..
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	..	..
Northern Union, Bonds, 5's.	1,250,000	1,000	102½	105½
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	111	113
" 1st Con. 5's	1,500,000	..	106	108
Standard	5,000,000	100	125	13
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299.630	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	213	220
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	⅜	3/16
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works..	450,000	100	28	30
" 1st Mtg.5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	3¾	4
" " Bonds, 5's	5,250,000	1,000	19¾	.
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	99¾	100
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,622,720	100	88¼	89¼
Preferred	3,026,500	100	107½	109
Consumers, Toronto	2,030,000	50	200	204
Consolidated, Baltimore	11,000,000	100	76	77
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	119
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	86	90
Consolidated G. & E. Co.'s.				
Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,608,000	1,000	99½	100
Detroit Gas Co., 5's	981,000	1,000	75	75¼
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	25	..
Grand Rapids Gas Lt. Co. 1st Mtg.5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	67	68
" Bonds, 5's	10,500,000	..	103½	104½
Indianapolis	2,000,000	..	60	70
" Bonds, 6's	2,650,000	..	103¾	106½
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,823,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	..	..
Preferred	2,500,000	100	75	100
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	138	140
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108½
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	1,000,000	25	64	70
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	99½	100
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	.
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	15,800,000	100	58½	58¾
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	93	93½
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	113½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	46	48
Bonds	2,047.000	1,000	94	96
Washington, D. C	2,600,000	20	287½	292½
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	.	..	..
Wilmington, Del	600.000	50	220	..

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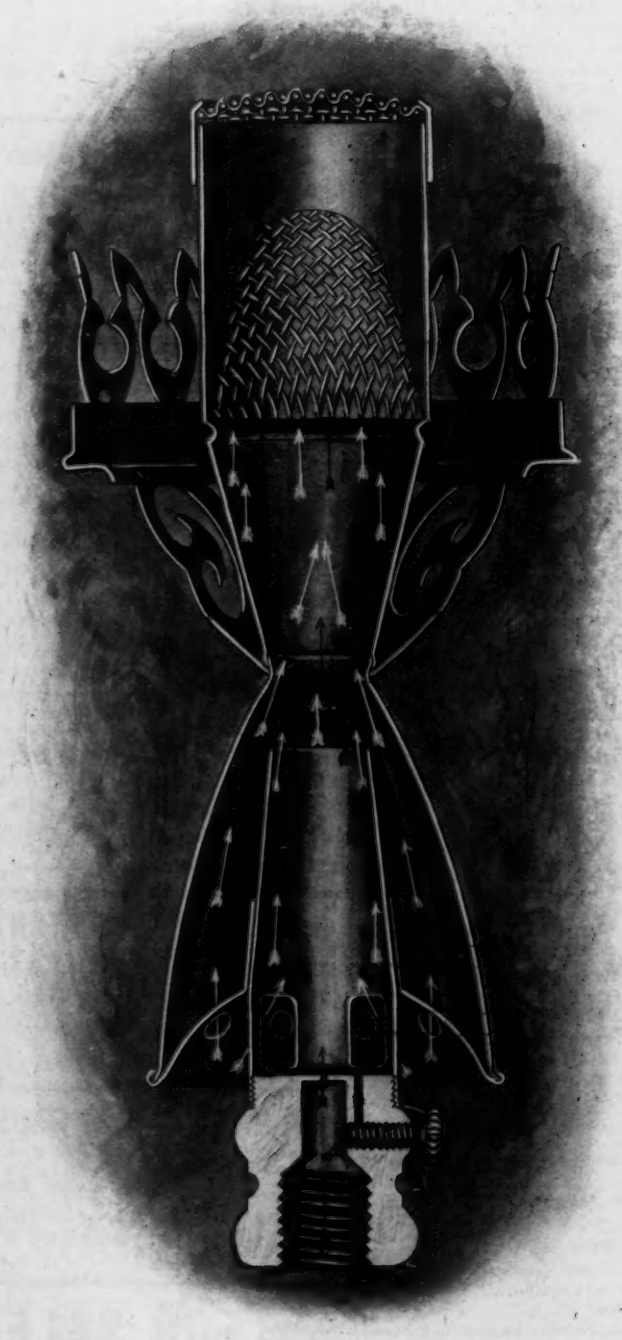

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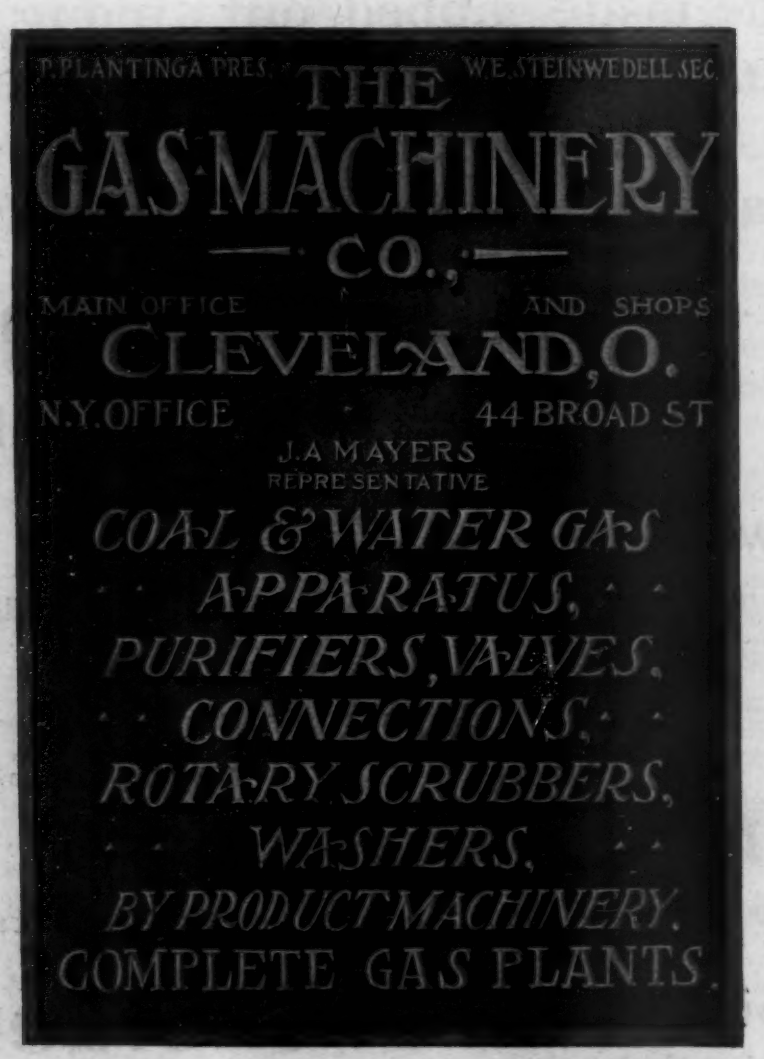

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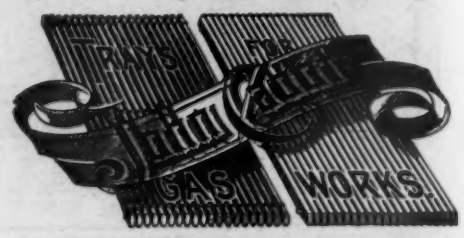

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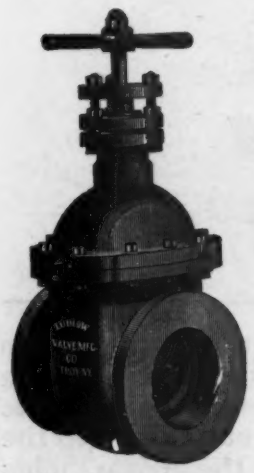

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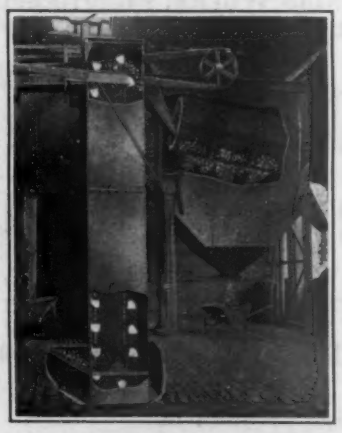

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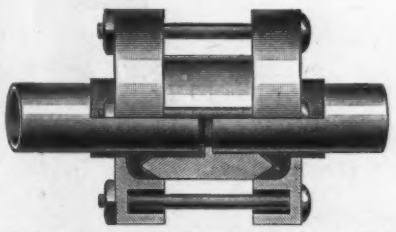

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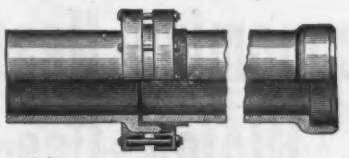
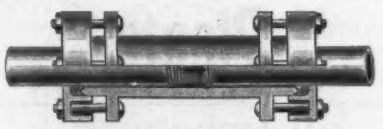
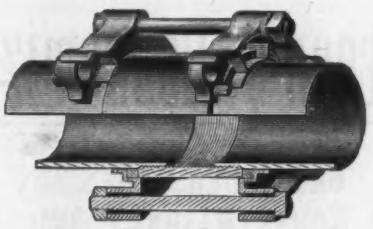


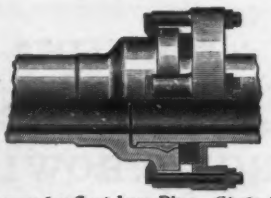
Insulating Coupling for Dresser Bell and Spigot Cast Iron Pipe. Style 6.



Regular Sleeve. Style 2.



Clamp. Style 4.



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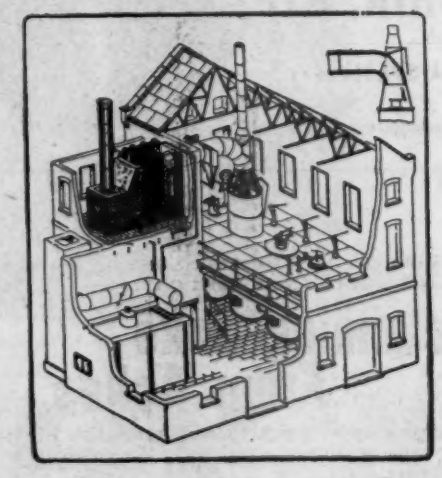

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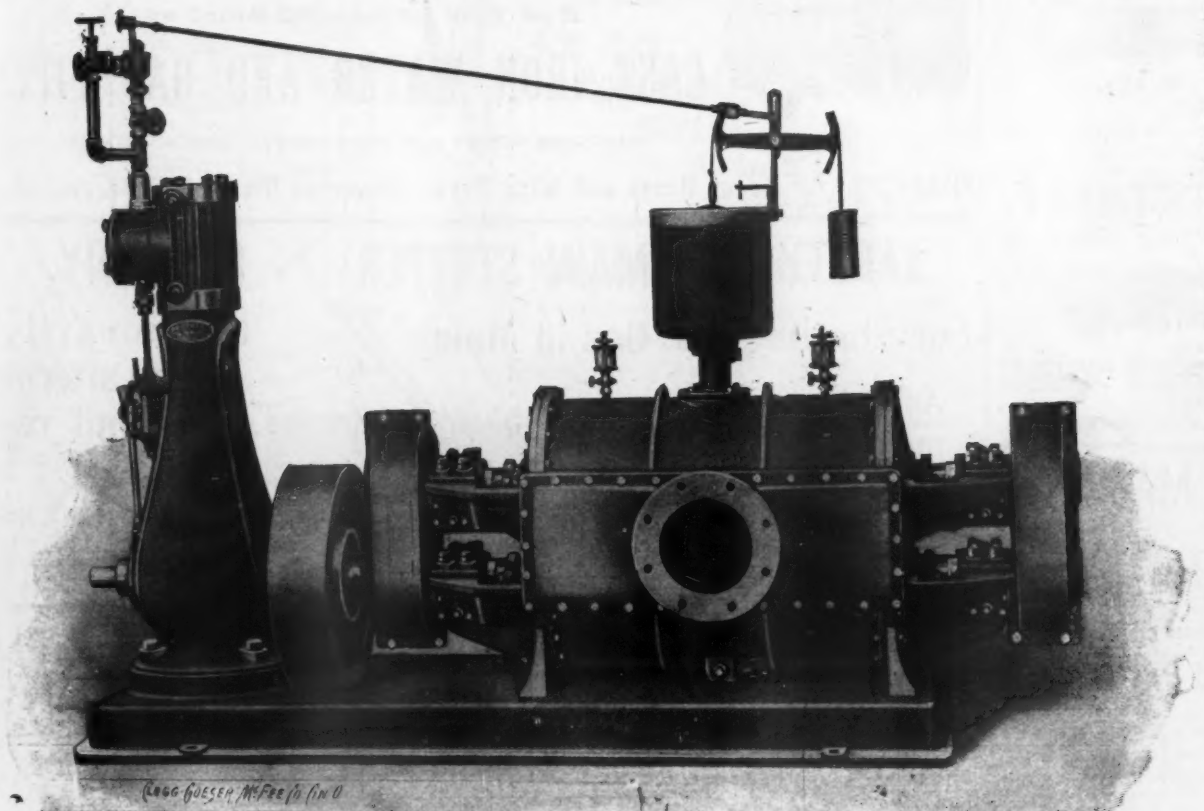

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This Computer solves the following formula, which is applicable to Gas, Air and other elastic fluids, flowing through long pipes with high initial pressures:

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Where d = diameter of pipe in inches,
p_1 = absolute initial pressure in pounds per square inch,
p_2 = absolute terminal pressure in pounds per square inch,
L = length of pipe in miles,
w = specific gravity of the fluid when air = 1.

To Find the Discharge from a Pipe and the Required Size of Pipe.

(1.) Set the specific gravity of the fluid opposite the length of pipe;
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PUBLIC LIGHTING TABLE.

AUGUST, 1904.

Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M.
Mon.	1	7.40 PM	11.00 PM	7.10	3.30
Tue.	2	7.40	11.30	7.10	3.30
Wed.	3	7.40	12.00	7.10	3.30
Thu.	4	7.40 LQ	12.30 AM	7.10	3.30
Fri.	5	7.40	1.10	7.10	3.30
Sat.	6	7.40	2.00	7.10	3.45
Sun.	7	7.30	2.50	7.10	3.45
Mon.	8	7.30	4.10	7.10	3.45
Tue.	9	7.30	4.10	7.10	3.45
Wed.	10	7.30	4.10	7.10	3.45
Thu.	11	7.30 NM	4.10	7.10	3.45
Fri.	12	7.30	4.10	7.10	3.45
Sat.	13	7.30	4.10	6.55	4.00
Sun	14	7.30	4.10	6.55	4.00
Mon.	15	7.30	4.10	6.55	4.00
Tue.	16	9.20	4.10	6.55	4.00
Wed.	17	10.00 FQ	4.10	6.55	4.00
Thu.	18	10.40	4.10	6.55	4.00
Fri.	19	11.30	4.10	6.55	4.00
Sat.	20	12.20 AM	4.10	6.45	4.10
Sun.	21	1.10	4.20	6.45	4.10
Mon.	22	2.00	4.20	6.45	4.10
Tue.	23	3.00	4.20	6.45	4.10
Wed.	24	No L.	No L.	6.45	4.10
Thu.	25	No L. FM	No L.	6.45	4.10
Fri.	26	No L.	No L.	6.45	4.10
Sat.	27	7.10 PM	8.30 PM	6.30	4.20
Sun.	28	7.00	9.00	6.30	4.20
Mon.	29	7.00	9.30	6.30	4.20
Tue.	30	7.00	10.00	6.30	4.20
Wed.	31	7.00	10.30	6.30	4.20

TOTAL HOURS LIGHTING DURING 1904.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	225.00	January	423.20
February	205.40	February	367.40
March	187.40	March	355.35
April	169.50	April	298.50
May	152.30	May	264.50
June	137.20	June	234.25
July	138.50	July	243.45
August	151.00	August	280.25
September	164.40	September	321.15
October	191.30	October	374.30
November	210.30	November	401.40
December	237.10	December	433.45
Total, yr.	2171.40	Total, yr.	4000.00

NEW YORK, 97 Liberty Street. BOSTON. 814 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

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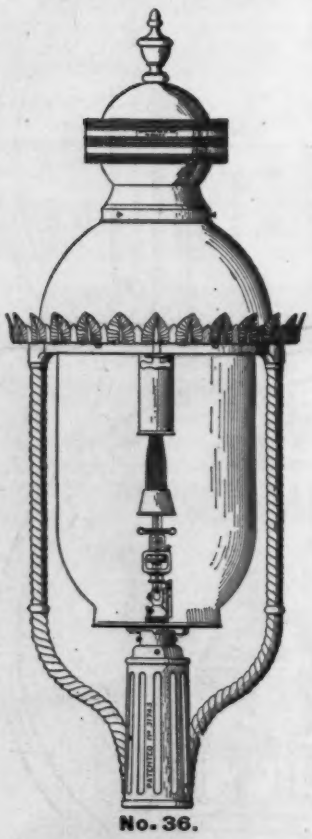
.... OF AMERICA ....



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The imitation stuff is bad for the customer---which is bad for you.

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Amesbury, Mass.	Washington, D. C.	Chicago (Ogden Co.)
Aberdeen, S. D.	Boone, Ia.	Easton, Pa.
Winsted, Conn.	Pueblo, Col.	Lawrence, Mass.
Canon City, Col.	Charlotte, N. C.	Council Bluffs, Ia.
Schenectady, N. Y.	Fall River, Mass.	Chattanooga, Tenn.
Hagerstown, Md.	Duluth, Minn.	Tuckerton, N. J.
Malden, Mass.	New York (Mutual Co.)	Springfield, O.
Bridgeport, Conn.	Waltham, Mass.	Easton, Pa. (2d contract).
Albert Lea, Minn.	Dover, Del.	Mobile, Ala.
Brooklyn, N. Y.	York, Pa.	Conshohocken, Pa.
Kansas City, Kas.	Minneapolis, Minn.	Mason City, Ia.
Hempstead, N. Y.	Allentown, Pa.	

TOTAL SETS FOR 1903, ... 62
TOTAL DAILY CAPACITY, ... 62,950,000 cubic feet.
TOTAL SETS TO DATE, ... 508
TOTAL DAILY CAPACITY, ... 362,780,000 cubic feet.

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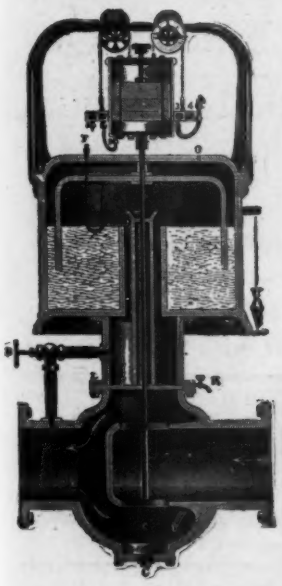

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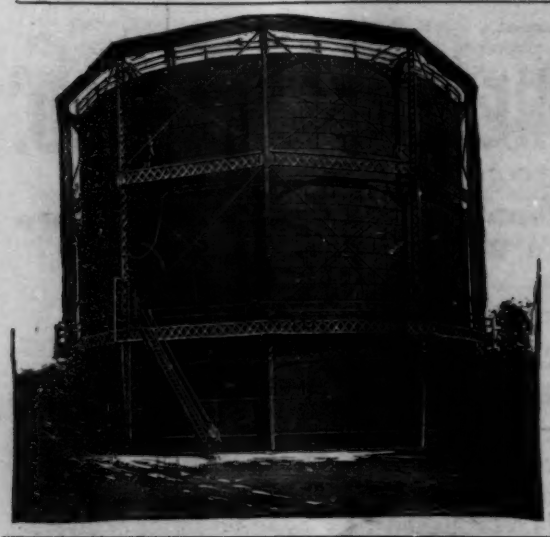

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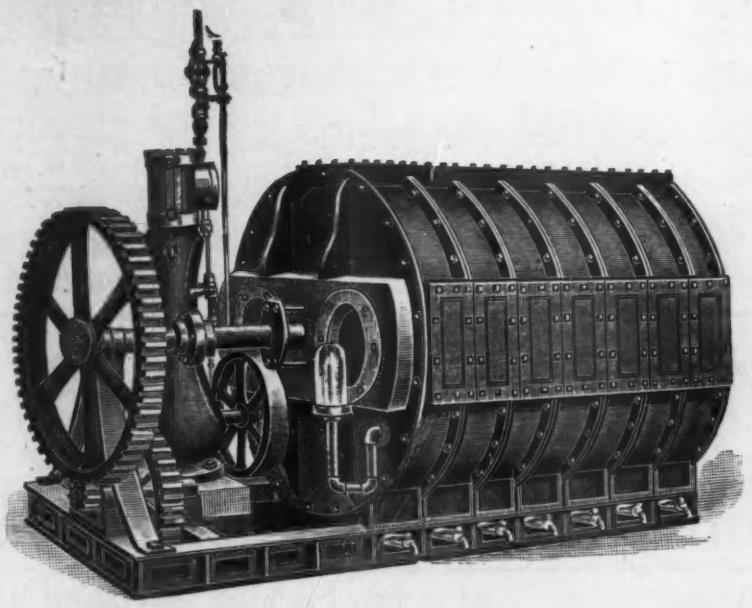

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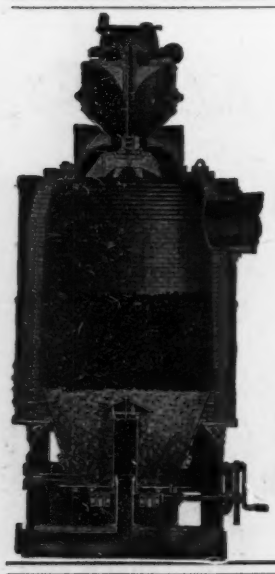

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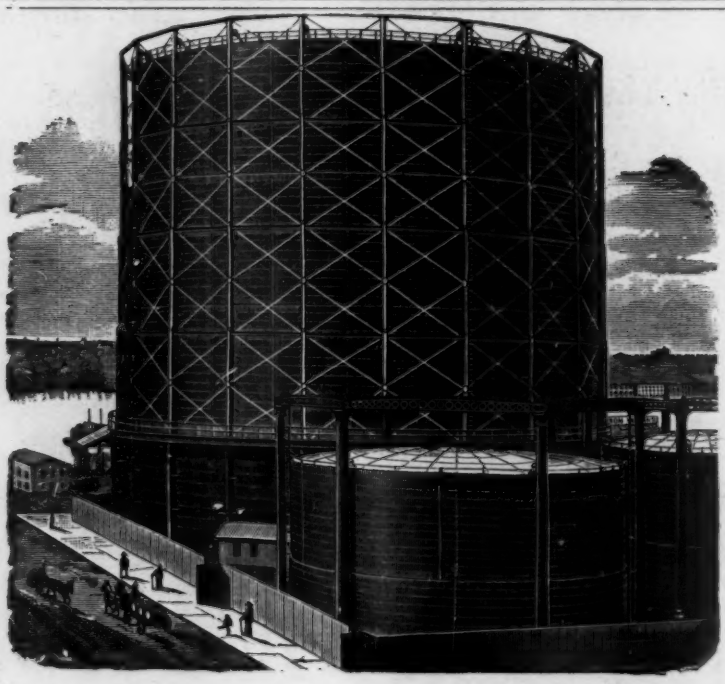

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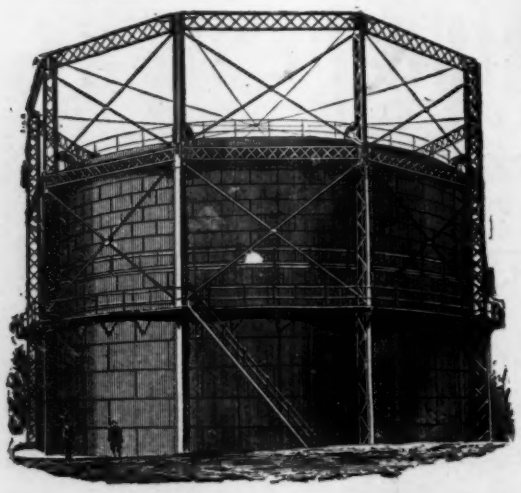

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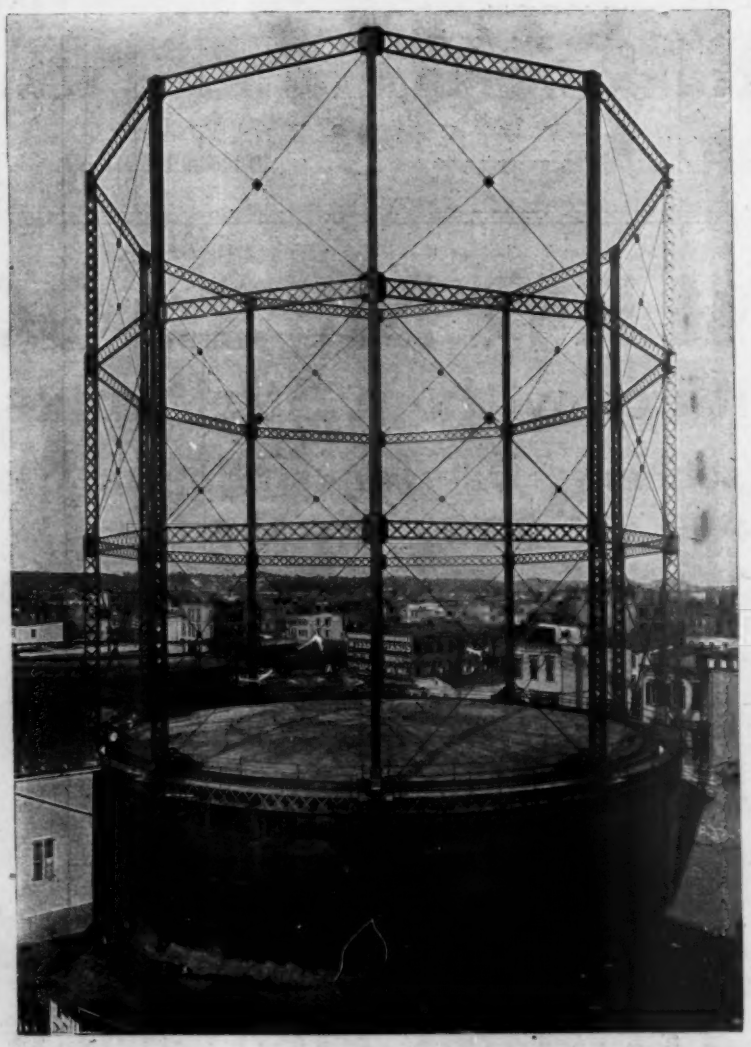

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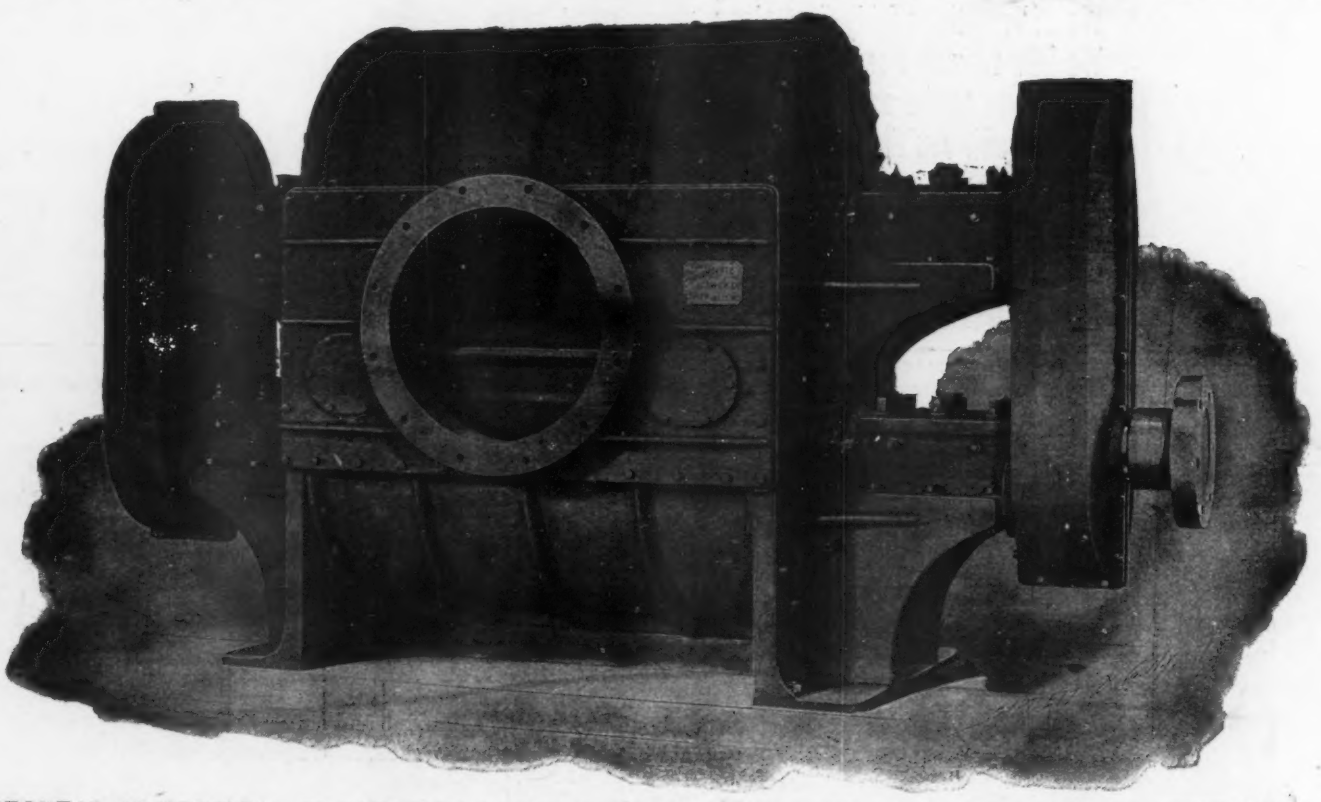

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